The Electrical Industry's Weekly Magazine

November 19, 1956

Electrical World

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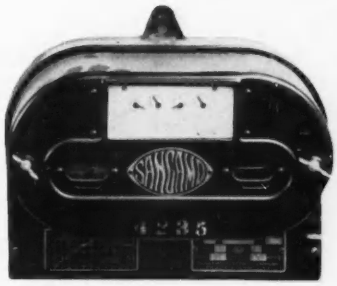

Meter Museum

Preserves the Past in New England

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Winter Peak Margin Is Down...p. 8

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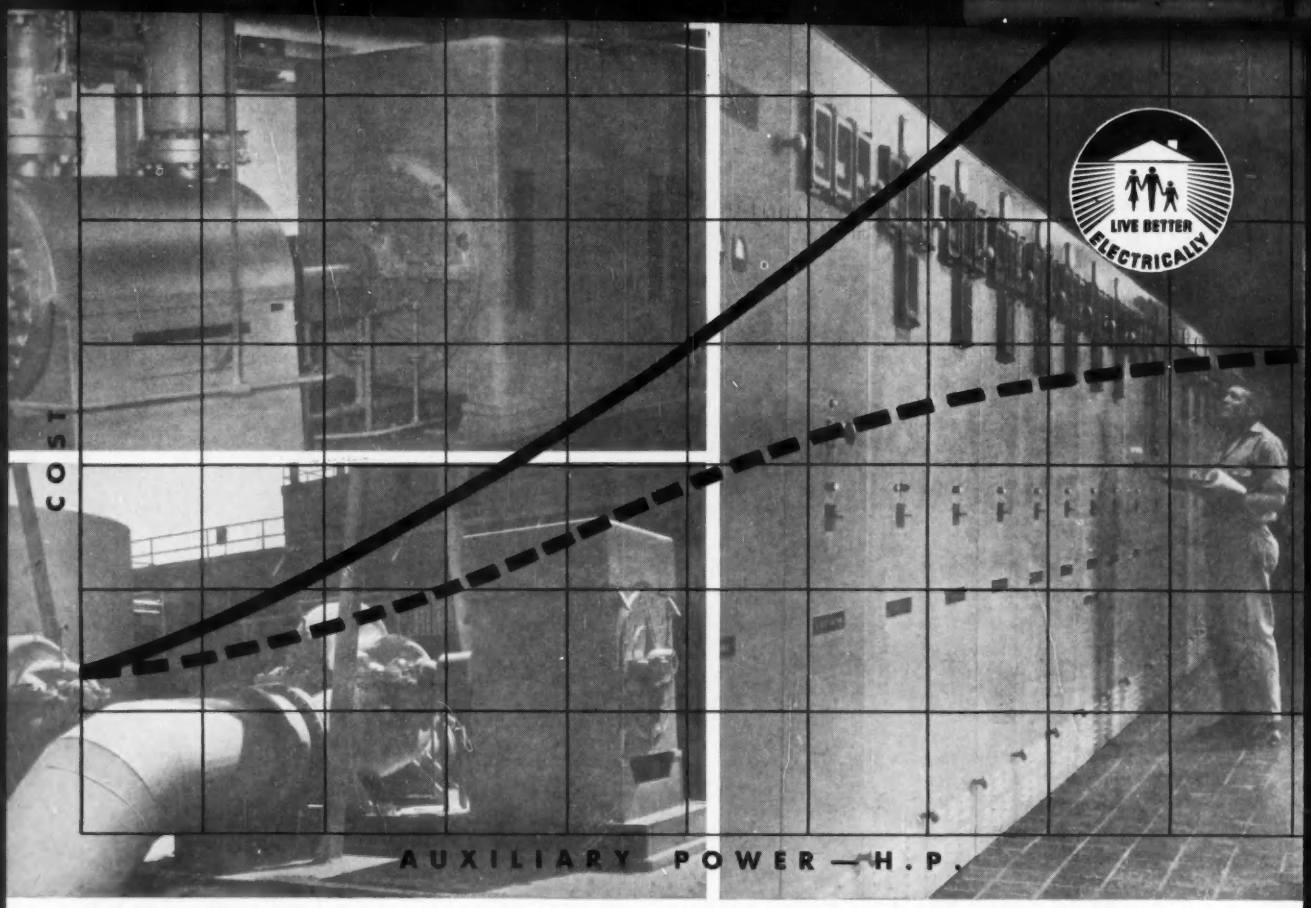
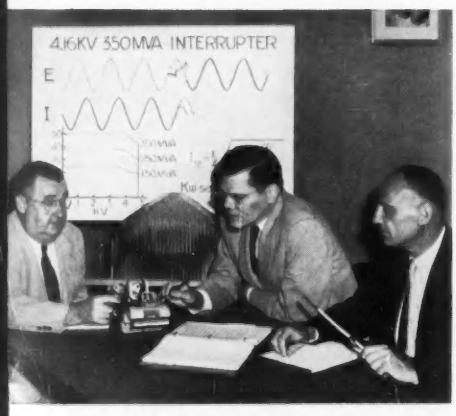


AUXILIARY POWER COSTS can be reduced by re-evaluating present system design with an eye to future expansion needs. Solid line indicates extension of a present method of system design. G-E study shows substantial savings possible by proposed method (dotted line).

How can power station costs be cut?

New General Electric study points to savings through careful engineering of auxiliary power systems



4.16-KV, 350-MVA SWITCHGEAR will serve large auxiliary power systems of the future. Above, engineering mgrs. G. M. Reed, E. M. Troischt, and J. G. Torbit, G.E.'s Medium Voltage Switchgear Dept., study design of interrupter components for new high-capacity, metal-clad, magne-blast equipment.

Units over 500,000-kw, operating at super-critical steam conditions are probable within the next several years. The trend towards increased unit size and higher pressures means auxiliary power requirements will increase rapidly.

A recent General Electric study based on an all-electric auxiliary system indicates that major savings can be made by thorough planning of the plant's auxiliary power system. For instance, for units as large as 200,000 kw and up, auxiliary system voltage is shown to be most economical at 4.16 kv rather than at higher voltages—even if it requires the use of as many as four buses. Another possibility for economic gain is offered by using split low-voltage winding transformers.

An additional cut in costs can be achieved by using selective motor throwover and paralleled throwover schemes for emergency and routine bus transfers, rather than transferring 100% motor load as is sometimes the practice. This proposed method of operation increases the size of units to which a particular rating of switchgear can be applied.

To obtain details on how intensive planning of the auxiliary power system pays off, contact your General Electric Apparatus Sales Office. For a copy of the study on auxiliary power systems, write for GET-2673, General Electric Company, Section 301-290, Schenectady 5, N. Y.

MORE POWER TO AMERICA

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ELECTRICAL WORLD

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or supplying electric power

Vol. 146 No. 21 **November 19, 1956**

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• • •

COMING NEXT WEEK—Utilities today are beset by many difficulties in the establishment of substations to serve the growing system loads. In a 16-page report, some solutions are developed in "Modern Design in Substation Problems."

New exclusive KEARNEY 0-51 and 0-52 Tools

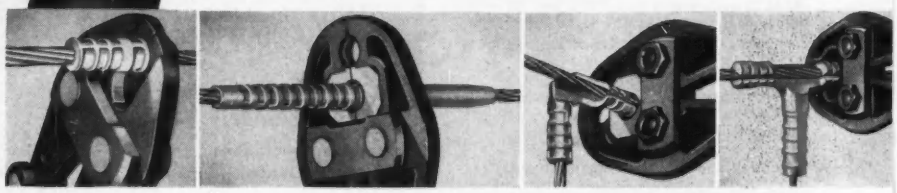
Out-perform all others!

Exclusive "Snap in-Snap out" Dies for faster installation of compression sleeves and fittings in widest size-range!

Another Kearney engineering first... and exclusive! New, low-cost 0-51 and 0-52 lever-action Tools make most distribution connections—install widest size range of compression sleeves and fittings. Extra speed and convenience because Kearney original "snap in-snap out" insert dies can be interchanged with two-finger ease! Lightweight, rugged construction. Write today for Bulletin 13.

Dies lock in place!

No tools needed. Self-aligning die halves "snap in-snap out." Utmost rigidity: each die part locks in rectangular seat by a shoulder and groove, is held in place by spring locking pins.



These connections can be made with 0-51 and 0-52 Tools:

SQUEEZONS—up to and including 4/0 ACSR, or stranded
L-TAPS—up to and including 2 ACSR, or stranded
T-TAPS—1/0 ACSR, or stranded
SERV-ENS—up to and including 1/0 ACSR, 4/0 stranded
SLEEVES—up to and including 4/0 stranded aluminum, 2/0 ACSR and stranded copper

Extra size range!

Fixed die in jaw nose installs Serv-Ens and L-Taps. Insert dies available to install sleeves and Squeezon fittings for most wire sizes used in distribution systems. Dies positioned close to fulcrum pins so minimum effort is needed on the tool handles. Wire cutter blades, also available, snap into same seat as the dies.

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EDITORIALS

Lets Make It a Week to Remember

Observance of National Electrical Week next Feb. 10-16 deserves the best cooperative effort of which the electrical industry is capable. For this is the industry's own week. It was conceived to build public appreciation of electricity and the part the electrical industry plays in our nation's progress and economy. By uniting all segments of the industry in a common effort, it gives every organization, company, and group an opportunity to enhance its position with its customers, its employees, and the public in its own community and in the nation.

Today no industry comes closer to the daily lives of Americans at home and at work than ours. Few industries have done more than ours to make our nation strong and the American home a better place to live. It is up to us to tell our story . . . the story of a great industry composed of a variety of interdependent groups all working together through the years to serve the nation.

The industry's plans for this second observance of National Electrical Week have been well conceived under the experienced leadership of Chairman Merrill E. Skinner, vice president of Union Electric Co, St. Louis. Planning guides that form the basis for the Week's activities have been distributed and enthusiasm is building from every quarter.

Now is the time for individual companies to start putting together a comprehensive program of observance in the communities that they serve. The success of National Electrical Week depends on the cumulative effect of these individual company programs all taking place at the same time, and all focused on the same objective.

Interconnection Passes a Milestone

Formation of the Pennsylvania-New Jersey-Maryland Interconnection by eight electric companies in these three states marks a significant milestone in the history of interconnected power system operation that should not go unrecognized. For the new pool is a direct out-growth of the well and affectionately regarded Pennsylvania-New Jersey Interconnection. Formed in 1927 the latter group, and the Connecticut Valley Power Exchange formed two years earlier, pioneered the concept of interconnected power system operation in this country. Under this concept participating companies operated their facilities as a unit and shared equally the resulting savings.

It is altogether fitting that this new pool which springs from one of the original interconnected system operations should now become one of the biggest in the nation. Its operations bring many benefits to its customers, to its companies, and to the nation.

To electric service customers in the tri-state area the new pool, serving an area of 48,000 sq miles and some 15 million people, guarantees not only more reliable but more efficient service.

To participating companies who have linked generation and transmission facilities totaling 9,877,250 kw, this interconnection brings such multiple economies as reduction of spinning reserve requirements, economy energy savings through pooled dispatching, assured backup power for emergency and maintenance outages, and coordinated timing of capacity additions that permits use of much larger, more efficient units at less cost.

To the nation as a whole in these troubled times, this and similar interconnections operating throughout the utility industry bring assurance of a sturdy, vigorous, and flexible electrical network ample for the needs of the country under all circumstances.

New York's Acceptance of Wiring Need Growing

One of the encouraging signs to be seen in the results of Con Edison's three-year-old adequate wiring program for New York City is the steady increase in public awareness of the significance of adequate wiring.

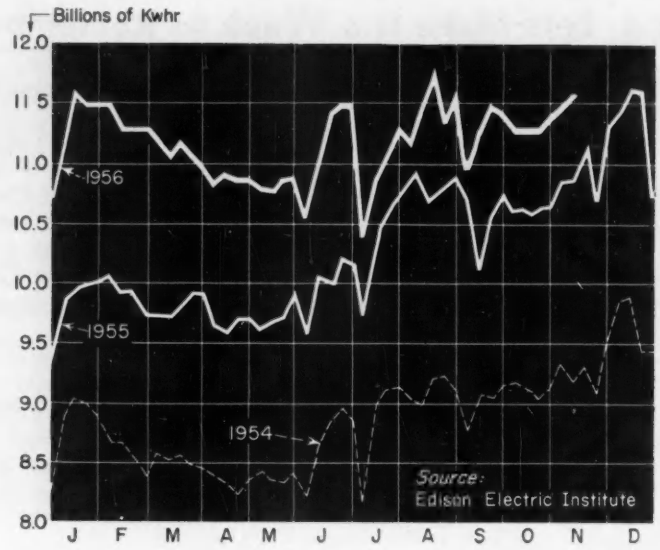
This clue is found in the fact that requests from apartment buildings owners for wiring studies in the past 12 months are up 33% over the previous period and recently have averaged more than 150 a month, up 74% as compared with two years ago.

Another clue is the steady increase in apartment buildings rewired. In 1954, first full year of the program, 68 apartment buildings were rewired for higher capacities; in 1955, 160; this year 230 is the estimate. Prospect for 1957 is 500.

Here is further proof that public acceptance of adequate wiring can be established and that it "snowballs" when pushed by an effective program.

ELECTRICAL WEEK

LAST MINUTE



OUTPUT

Week ended Nov. 10, 11,522,000,000 Kwhr Up 5.9%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 5.9%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Nov. 10	+5.9	+9.6	+4.0	+4.0	+7.3	+4.8	+12.4	+8.2	+9.5	+6.9
Nov. 3	+5.8	+5.6	+5.5	+3.1	+6.7	+4.0	+12.0	+9.5	+12.7	+8.0
Oct. 27	+6.9	+7.5	+5.5	+5.6	+7.3	+5.9	+11.6	+8.6	+10.8	+7.8

Seasonally Adjusted Index 219.7 Week Ago 219.7 Year Ago 207.2

Here are the issue's highlights . . . Theme of interdependence was paramount at NEMA convention . . . Estimated December generating capacity reserves are down to 15.5%, reports EEI. Margin expected to be smaller in '57 . . . Memphis to issue $154-million of revenue bonds for 812-Mw plant . . . Pacific P&L starts soon on Swift Dam Project . . . One-hour lighting boycott tried by Con Ed customers to protest proposed billing change . . . Savings of $½ million comes from reduced insulation on 1,300 Mva of substation transformers . . . Magnetic amplifier, transistors are becoming components of growing systems . . . Three-to-one margin assures positive overcurrent relay action . . . Truck stop's 175-kw load points to coming highway program's potential . . . About one-fourth of job applicants have hearing defects.

New NEMA President is Arthur A. Berard, also president of Ward Leonard Electric Co, Mt. Vernon, N. Y. (picture, p 10). NEMA vice presidents elected at last week's Atlantic City convention are N. J. MacDonald, president, Thomas & Betts Co; B. C. Neece, president, Landers, Frary & Clark; W. V. O'Brien, vice president and general manager, apparatus sales division, General Electric Co; J. L. Singleton, vice president, industries group, Allis-Chalmers Mfg Co; and J. J. Mullen, president, Moloney Electric Co. New treasurer is F. F. Loock, president, Allen Bradley Co.

Utilities participating in Housepower program will pay 2¢ per domestic meter in support of the wiring campaign. Letter recently advised company presidents of plan; more detailed information for sales executives will follow.

Westinghouse ships, reportedly the first ever built of its size, 10 million-kva interrupting rating, 1,600-amp, 138-kv dead bank, compressed air circuit breaker. Twenty-one more are to follow. All are for installation by Consolidated Edison Co of New York.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . Interior Secretary Fred A. Seaton asks FPC to review Southwestern Power Administration rates with Reynolds Metals. Current Reynolds rate is 5.2 mills per kwhr. Interior wants new rate of 6.97 mills proposed for SPA area made applicable to Reynolds . . . **Administration has several proposals ready** for consideration of next Congress which provide for partnership development of multi-purpose river structures, discloses Seaton.

Liquid sodium is "too hot" for heat exchanger in Navy's "Seawolf" atomic submarine to handle. Sodium is used as coolant in transferring heat from reactor to boiler. Breakdown is reported in transfer system caused by unusual characteristics of hot, radioactive sodium.

In a step to make New York City the "engineering capital of the world," United Engineering Trustees, Inc, contracts for preliminary studies of a new engineering center in the city. Members, including AIEE and ASME, recently voted to remain in New York.

A new electronic generation assignment device (EGAD) will save an estimated $24,000 annually through incremental loading of generating units on system of Public Service Co of Colorado. EGAD has two exclusive features—turbine back pressures can be cranked into the computation, and spinning reserve may be read directly and instantly by system dispatcher.

Florida P&L and IBEW sign new contract raising average hourly wage approximately 5%. It is voidable by either party after Sept. 30, 1958. Major provisions: average wage increase of 6.03%, one-year wage and shift differential reopening, another holiday (Memorial Day).

Halsey Stuart group wins $50-million Public Service E&G first mortgage and refunding bonds due 1986 at 4⅜%; reoffers at 101.257% to yield 4.3%.

Congratulations . . . Alden F. Krieg is new executive manager of Northwest Electric Light & Power Assn, succeeding Berkely Snow . . . **Ansel A. Packard** is appointed assistant to Connecticut Power Pres Austin Barney.

ABOUT PEOPLE IN THE INDUSTRY

"As manufacturers of so many electrical devices, we can never stand still, but must continue to pioneer and develop new products, new methods, and better selling," NEMA's outgoing Pres **J. W. Corey** told 30th annual convention. He said NEMA is now entering the "not fully explored" farm market to encourage the use of more electrical equipment there. "A farm needs automation as well as a factory," he said.

Russia is "developing power resources at a colossal rate," reports Britain's Sir John Hacking, formerly of Central Electricity Authority, on return from a tour of Soviet hydro plants. He said aside from concentration on heavy power, there was nothing radical or unconventional in the installations. Hacking remarked "I was impressed with the thoroughness of planning and design" of the Russian-built equipment.

More News About People page 38

December Margin Down to 15.5%,

December peak load estimates revised upward. Capability addition estimates revised downward. That's the outlook for the electric utility industry told in Edison Electric Institute's 20th Semiannual Electric Power Survey to be released this month. Basic findings are shown in the graphs and tables on these two pages.

A thriving industrial economy and rising residential usage help account for the estimated peak of 106.2 million kw in December—up 352,000 kw above the peak load estimated earlier this year (EW, May 28, p 116) and 8.1 million kw above last winter's peak load. This percentage gain of 8.3% over last year is about the same as is anticipated for December 1957 over this winter's peak.

Expansion delays caused by the strike at Westinghouse Electric Corp were a key factor in lowering the capability addition estimates. About one million kw less capability will be available for this winter's peaks than was anticipated in the earlier survey.

As a result the margin of capability over peak loads will be down to 15.5%—lowest since 1952 and a full percentage point lower than the earlier estimates. The latest survey shows the margin for next winter under median hydro conditions will be only 14.8%, also a percentage point below the margin estimated earlier this year.

In every power region (see map below) margins will be down from last December. Region VII, encompassing the Pacific Northwest, promises to be critical with a bare overall margin of 2% under median hydro conditions. Eastern division of this region now has an estimated December peak load margin of only 1.6%, and adverse hydro conditions would put the mainly hydraulic West division of the region in the hole by 774,000 kw at the winter peak according to the recent estimates.

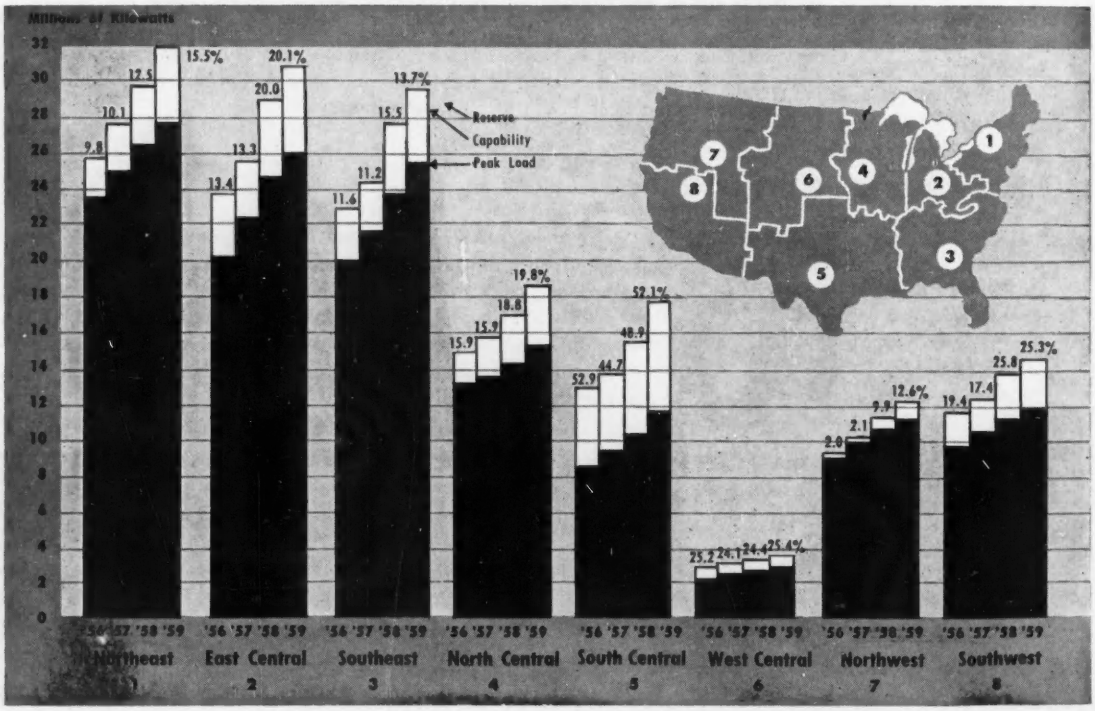
Other highlights of the latest EEI report:

- Next year's summer peak load margins will drop to 16.2%—down from 22.8% for the past cool summer with most dramatic drop coming in Region V, the Southwest, where industrial expansion makes large gains.
- Scheduled capability additions for 1958 are now estimated at 15.9 million kw, a new record, and well over twice the amount of capability placed during the current year.
- This expansion will help industry to build back margin to 19.6% for December of 1958—up from the low of 14.8% estimated for next year.
- Margin now estimated for 1959 of 20.5% would be on par with the margin existing at the winter peak in 1954.

On a percentage increase basis, peak loads will outpace capability additions until 1958. Estimates in the latest survey forecast a peak load increase this year of 8.3% over last year compared to a capability increase of only 5.5% over the previous December. Peak load now forecast for December of 1957 will be 8.4% greater than this year's peak while capability additions will add up to a 7.7% increase above this year.

The survey results indicate that

Estimated December margins down this year, smaller in '57 . . .

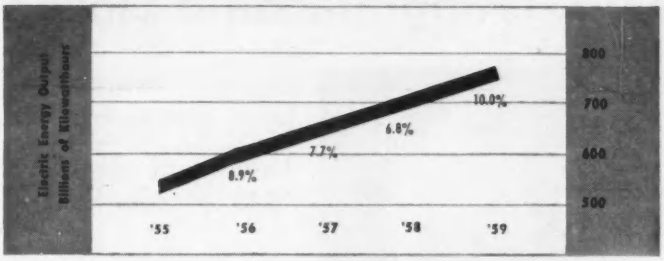


Says EEI

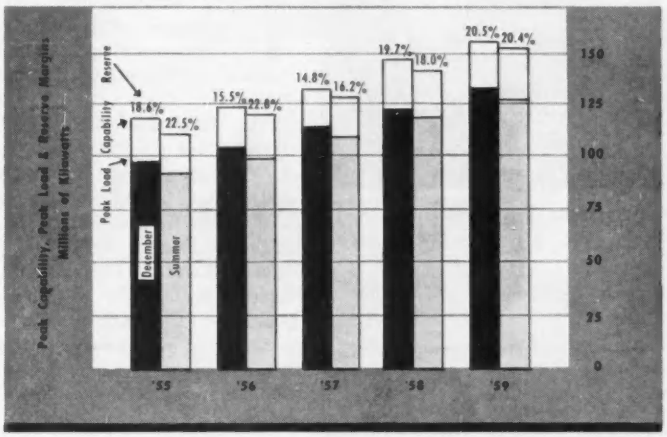
electric utility output will climb from 601.3 billion kwhr this year to 753.6 billion kwhr in 1959.

Another bright spot in the survey results shows gradually increasing annual load factor through 1958 for the industry as a whole. From an annual load factor of 62.8% in 1954 these climb to 63.6 in 1955, 64.6 this year, 65.0 in 1957, and 65.1 in 1958. According to the survey, the industry load factor will then drop back to 64.9% in 1959.

The survey findings were reported by the Electric Power Survey Committee of EEI in cooperation with the power area representatives of the electric power systems. The report is usually based on data which covers about 97% of the capability and 98% of the energy output of the country's electric systems including electric companies, federal and non-federal agencies. All data relating to capabilities, loads, margins, and energy outputs are based on the specific coverage of the survey and are not adjusted for 100% coverage.



EEI Survey shows constant energy output climb . . .



. . . and safe national margins for summer peaks

. . . while summer peaks tend to rise as percent of following winter peak

Summer Peak Loads (Thousands of Kw)

Region	1956 Summer Peak	1956 % of December 1955	1956 % of December 1956	1957 Summer Peak	1957 % of December 1956	1957 % of December 1957	1958 Summer Peak	1958 % of December 1957	1958 % of December 1958	1959 Summer Peak	1959 % of December 1958	1959 % of December 1959
I	20,652	92	88	22,860	98	92	24,337	98	93	26,083	99	94
II	18,120	95	88	20,570	100	91	22,299	99	92	24,396	101	94
III	18,124	99	90	20,000	100	92	21,859	100	92	23,231	97	90
IV	12,105	100	95	13,091	102	97	13,982	104	98	14,961	105	98
V	10,467	140	124	12,143	144	127	13,586	142	129	15,110	143	130
VI	2,090	110	93	2,366	106	94	2,610	104	95	2,841	103	95
VII	7,298	89	81	8,610	96	87	9,173	93	87	9,750	93	88
VIII	9,360	108	98	10,574	111	101	11,309	108	102	11,973	108	102
Tot.*	* 98,216	100	93	110,214	104	96	119,155	104	96	128,345	104	97

*Values for total U.S. are sum of regional totals and do not reflect the fact that maximum loads occur in December for most regions.

U. S. Living Standard Linked to Electricity

Cordiner: Ties Kwhr to Life

Berard: Man of Vision

Tate: A Warm Personality

National Electrical Manufacturers Association convention hears how various industry segments are "interdependent"

Number of electrical manufacturers has climbed since 1945, yielding better equipment designs and lower costs

Interdependence—the reliance of each segment of the electrical industry on every other segment—was the theme of the annual convention of the National Electrical Manufacturers Association meeting in Atlantic City last week.

This theme was sounded in the address of retiring NEMA President J. W. Corey who stressed the mutual dependence of the various product sections of the Association. He cited the National Adequate Wiring Bureau and the National Farm Wiring Conference as the sort of promotional programs that point up the interdependence of the industry. Both require broad support and hold the promise of building market on a broad scale, he added.

Competition, Progress Stressed

General Electric Co Pres Ralph J. Cordiner reiterated the convention theme, and emphasized the importance of competition and technological progress in the industry's task of better serving its ultimate customers. He noted that such Asiatic countries as India, Ceylon, and Pakistan generate less than 25 kwhr per person and that per-capita income is extremely low. The United States, which boasts the highest standard of living in the world, in contrast, has a per capita output of better than 3,000 kwhr a year.

"Here," continued Cordiner, "is clear evidence of one of our common interests in the electrical industry—our 'interdependence' in bringing the people of the United States the higher levels of living and the greater national security that flow from an abundant supply of electric power and electrical products flowing into a free market."

Cordiner said that such programs as "Housepower" and "Live Better . . . Electrically" have an important role in industry advances, but the greatest progress arises from the technological and other improvements in product value as a result of competing with one another.

On the score of competition, Cordiner noted that the number of firms in electrical manufacturing has risen from 4,400 firms in 1945 to 5,600 in 1953. These additional firms increase the competition—in design, in cost-reduction, and in pricing. The U. S. capitalistic economy, said Cordiner, depends primarily on competition as the primary force of economic growth and market development.

Presentation of the "Interdependence" theme reached a climax in a professionally cast and staged revue titled "Spirit of Interdependence '56," which highlighted top sales promotional programs now in progress by all segments of the industry. The fast-moving show was geared to winning over a small electrical manufacturer to important industry promotional programs. These included several NEMA section programs such as certified lighting and farm electrification. The sketch concluded on the note: "Make every employe a salesman for electrical living—the only way interdependence can be effective."

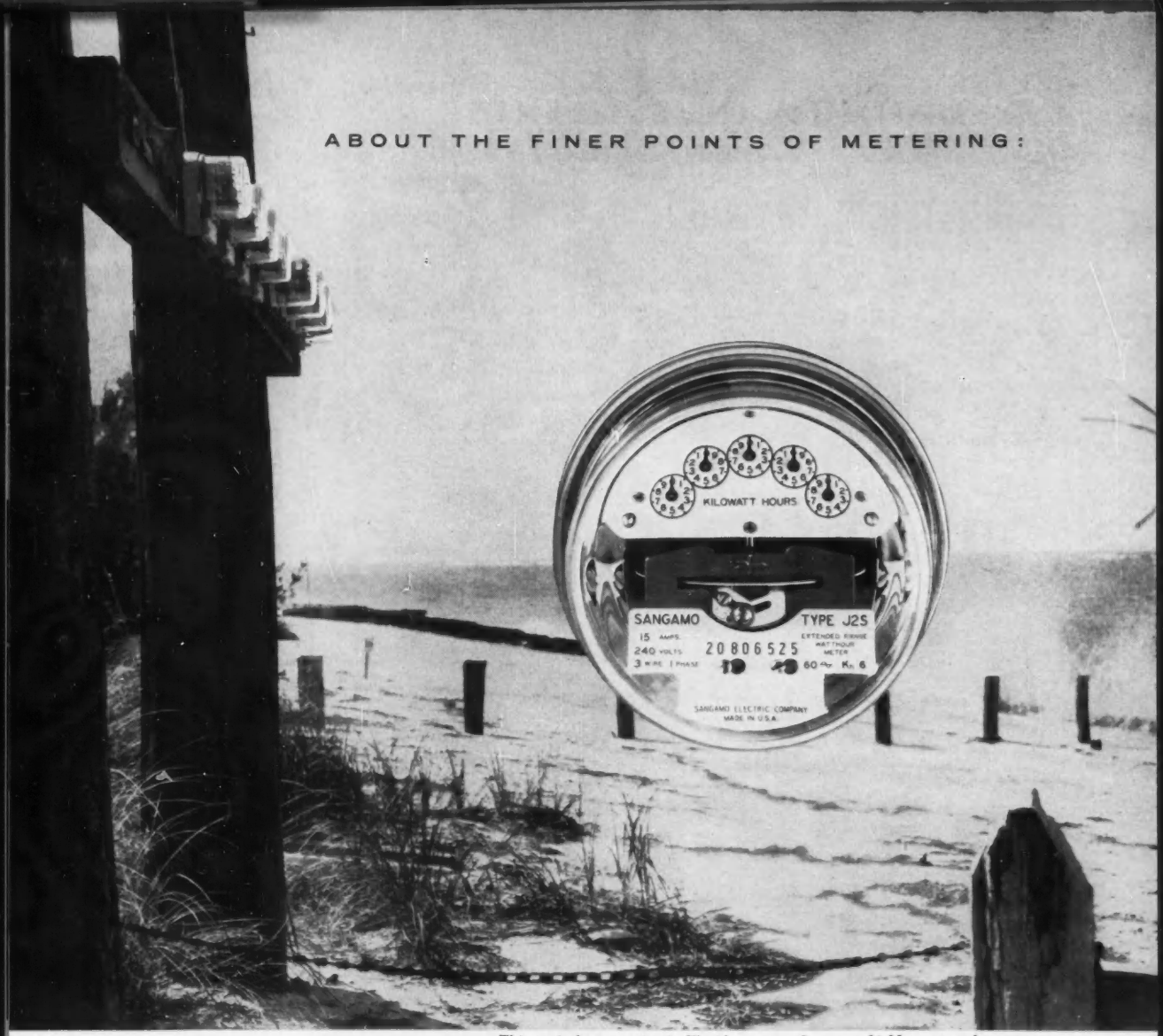
Two Win McGraw Award

In a more serious vein, delegates attending the meeting witnessed presentation of the James H. McGraw Award to two of their fellow members for personal contributions of merit in the electrical manufacturing industry.

Arthur A. Berard, president, Ward Leonard Electric Co, Mt. Vernon, N. Y., received the award for bringing "vision, perspective, sound judgment, and unfailing good humor to many complex problems."

V. Robins Tate, executive vice president of the Perfex Corp, in winning the McGraw Award, was cited for "a warm personality and enthusiastic spirit (which) were strong factors in capturing the interest of prospective members to form the first comprehensive industry organization of automatic control manufacturers."

New officers and other award winners will be carried in a subsequent issue of Electrical World.



This typical test station in Florida exposes Sangamo J2 Meters to salt vapor atmospheres as part of Sangamo's continuous program of improvement.

Field tests prove corrosive atmospheres can't hurt J2 Meters

Longer meter life—even under the worst possible service conditions—is the subject of constant study and research at Sangamo.

The findings of continuous field tests since 1952 at salt atmosphere test stations on the coasts of California—Texas—Florida . . . corrosive industrial atmosphere stations in chemical industry areas, are the basis of the corrosion-resistant design of the J2.

All external and internal meter parts are given complete protection against all conditions of outdoor exposure. The use of rust inhibitors, oxide films, inorganic seals and special plating on all metal parts and the inert organic Selkyd meter base assure many years of maintenance-free service under the toughest conditions.

And remember, the J2 Meter is the *slow speed* meter—only 10 revolutions per minute at full nameplate rating—another reason why the J2 is your best investment in a watthour meter.

Live Better Electrically

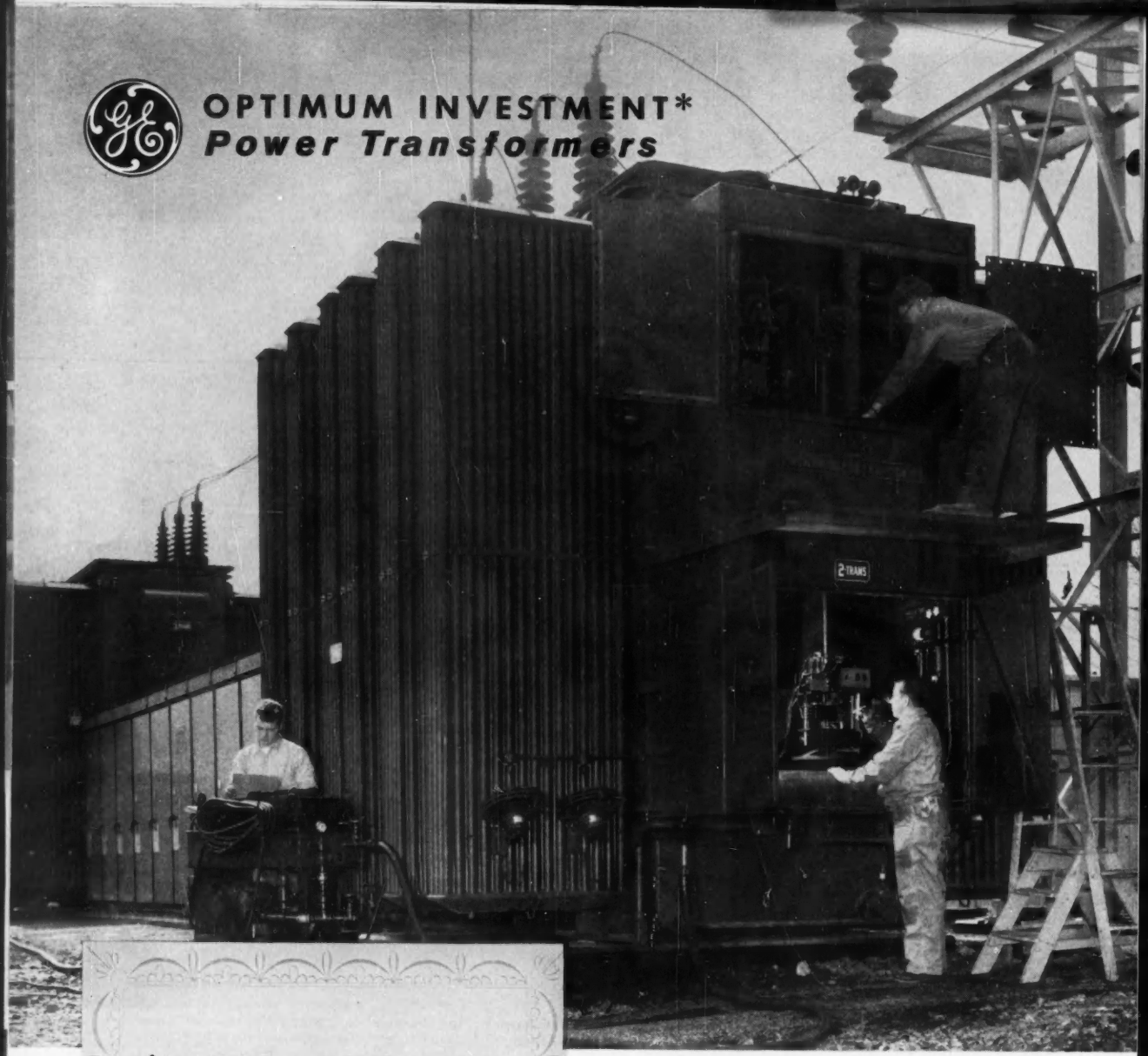
SANGAMO

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM56-7

OPTIMUM INVESTMENT*
Power Transformers

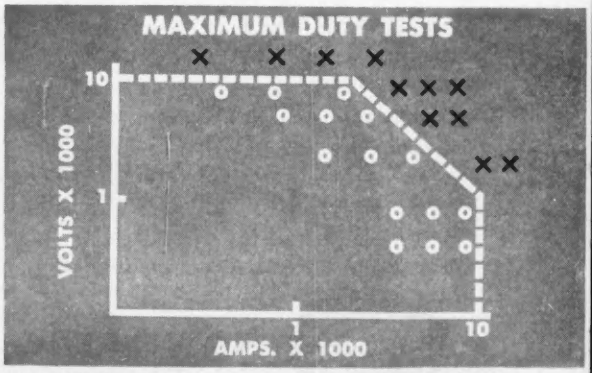


*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your investment in General Electric large power transformers, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements, greater reliability reduce outages.

G-E LTC EQUIPMENT now has 4 times the tip life of 1936 mechanisms. Maintenance, when needed, is simplified by hinged doors, roomy accessibility, and reusable Nitrile gaskets. Shown above is 15,000-kva, 69-kv unit.



SHORT-CIRCUIT DUTY is an important, extra feature of G-E LTC equipment. Each mechanism is thoroughly tested and applied only where test data (circles) proves ability to successfully operate under short-circuit conditions.

In the next five years . . .

Utilities will save $2,000,000 capitalized cost of reduced load-tap-changer maintenance

300% increase in LTC contact life in 20 years results from improved General Electric product features

Utilities have reported they spend an average of $200 each time they inspect and/or maintain LTC equipment. This is necessary about every three years. Yet today, General Electric load-tap-changers have an average of four times the tip life, for equal applications, compared to twenty years ago. On this basis and for the number of LTC equipments General Electric will ship in the next five years, assuming a 12% capitalization rate, electric utilities will save over $2,000,000 capitalized cost of LTC maintenance.

New and better design features developed by General Electric have made such savings possible. Heavier and thicker Arconite contact tips wear longer before replacement is necessary. Electrostatic shielding along panels and insulating rods breaks up creepage paths and eliminates the need for sporadic maintenance. Electrical and mechanical soundness is proven by the ability of mechanisms to complete a tap change even under short circuit—with no damage.

These and other G-E advances, such as those that reduce repaintings and prolong oil life, reduce your maintenance expense. And, combined with other features that give you low operating, purchase, engineering, and installation costs, they make your General Electric Power Transformer an *Optimum Investment.* General Electric Co., Schenectady 5, New York.

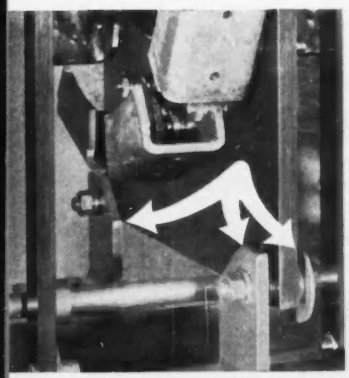
421-41

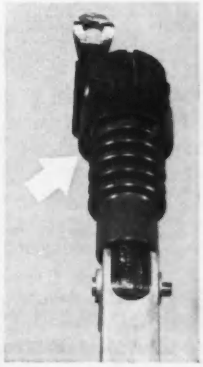
IMPROVEMENT OF LOAD-TAP-CHANGER PERFORMANCE

TYPICAL TRANSFORMER APPLICATIONS			EXPECTED TIP LIFE—Number of Operations	
KVA —MAX.	HIGH VOLTAGE —KV	RANGE —Per Cent	1936	1956
10,000	69 GR Y	±10	55,000	500,000
25,000	67 △	±10	70,000	140,000
55,000	115 GR Y	±10	30,000	160,000
92,000	110 GR Y	±10	40,000	65,000
166,700 (output)	230 GR Y	±7.5	24,000	50,000

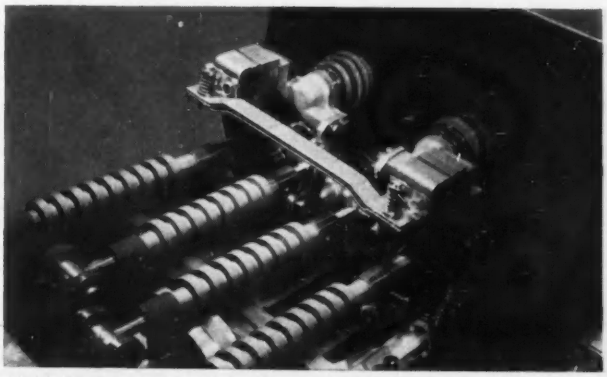
Progress Is Our Most Important Product

GENERAL ELECTRIC





ELECTROSTATIC SHIELDING by collars (right), washers and projected supports (left), reduces excessive maintenance cost by diverting "particle-attracting" electrostatic stress so creepage paths are not formed along insulation.



ARCONITE CONTACT TIPS last longer; life is further extended by controlling contact speed. Life of contacts, insulation, and mechanical parts; plus normal and short-circuit duty requirements, are completely co-ordinated for every application.

Where CREEP is a problem . . .

TESTS PROVE 90% LESS CREEP IN TELLURIUM LEAD ALLOY SHEATHING ON ROEBLING PAPER POWER CABLE!

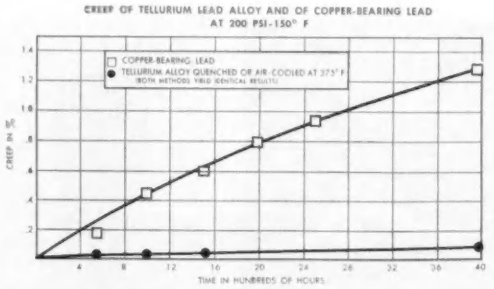
Roebling electrical wires and cables are available with either copper or aluminum conductors.

Only *one-tenth* the creep of ordinary cables—that's just one of the unusual properties of Roebling Tellurium Lead Alloy Sheathing on paper power cable, as shown by exhaustive creep tests in Roebling laboratories and by outside research. These impressive laboratory results are matched by field experience with thousands of feet of Roebling cable with Tellurium Lead Alloy Sheathing.

Look at the results on the graph yourself. You'll see that at 150° F Roebling Tellurium Lead Alloy Sheath stands up remarkably well, where copper-lead sheath, under the same conditions, stretches nearly 1.3% after only 4,000 hours at 200 psi.

Couple the unusual superiority of Tellurium Lead Alloy Sheath with the serviceable inner construction of Roebling Paper Power Cable—the uniform controlled-tension application of the paper tapes, for instance—and you have more than one reason why this cable is being specified by name, more and more, wherever power cable has to last a long, long time.

Write for full particulars today . . . rid yourself of cable problems tomorrow!


CREEP OF TELLURIUM LEAD ALLOY AND OF COPPER-BEARING LEAD AT 200 PSI-150° F
COPPER-BEARING LEAD
TELLURIUM ALLOY QUENCHED OR AIR-COOLED AT 375° F
BOTH METHODS YIELD IDENTICAL RESULTS
CREEP IN %
TIME IN HUNDREDS OF HOURS

ROEBLING

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J.

Subsidiary of The Colorado Fuel & Iron Corporation

Branch Offices in Principal Cities

Charge and Countercharge

H. B. Robinson, vice president of Carolina Power & Light Co, has denied that co-ops are saving money by buying power from Kerr Dam. The charges were made recently by W. T. Crisp, speaking at the annual meeting of the Central Electric Membership Corp.

Fifteen co-ops get Kerr Dam power through CP&L lines. The Southeastern Power Administration markets the power for the government.

Robinson said Kerr Dam is generating little power and the government is charging more than CP&L used to charge. "Our records show that SEPA has charged these co-ops an average of 8.12 mills per kwhr for power from Kerr Dam through the month of August. CP&L supplemented it with deficiency energy at 4.5 mills, under contract, and met co-ops' additional needs at the old rate of 7.5 mills." He said any savings to co-ops resulted from CP&L's 4.5-mill contract rate.

"In an average water year," he added, "Kerr Dam power will probably be sufficient to produce an actual saving to the co-ops." But because of the current dry year, SEPA furnished only the minimum allowable for three months, he said.

The Cost of Speed

An Ogdensburg, N. Y., motorist received an itemized bill for $237.75 from the city water department after he hit and sheared off one of its poles.

The bill listed: $175 for a new pole, $15 for power the department purchased, $4.50 for operation of a gasoline motor during the interruption of electric service, $31.20 for services of a pumping-station attendant, and $12.05 for an electrician. The motorist also had to pay a $25 fine for speeding.

Mah-jong by Candlelight

Consolidated Edison Co of New York, Inc, is seeking to rid itself of conjunctional billing—a practice which enables the owner of several adjacent buildings to buy electricity through one meter at step-down rates. In some cases, large housing developments are getting power at 9 mills a kwhr which is lower than Con Ed's average generating cost of about 11 mills.

The utility has applied to the Public Service Commission for permission to bill each building separately in an effort to strengthen its credit in the financial market. If approved, separate billing will increase gross revenues about $9.6 million, which would help Con Ed embark upon a $650-million, five-year construction program through sale of equity securities.

Vigorous protests to Con Ed's move followed swiftly. The hearing room was jammed, and opponents were outspoken. Meanwhile, thousands of families in co-operative apartment developments combined one night to switch off all lights between 9 and 10 p.m. Reporters subsequently found women continuing their mah-jong games by candlelight. Con Ed said the customer boycott was not reflected in system load.

Power for the Amazon

The first of five power plants in an overall electrification plan for Brazil's Amazon Valley has been completed about 70 miles inland at the power-starved river city of Belem. The plant now is generating 22,500 kw from oil brought in by ocean-going tankers.

An 800-meter pipeline carries oil from riverside docks to two 1,500-ton storage tanks. These in turn feed "daily use" tanks (two of 200-ton capacity).

Although the Amazon is the biggest river in the world, no one yet has worked out a satisfactory way of harnessing it for power. Sponsored by a Brazilian agency, the present scheme will provide later a total of 75,000 kw at different sites in the area.

Power Famine . . .

A power famine in the Pacific Northwest by 1959 is feared unless Pacific Northwest Power Co can get started on its proposed Mountain Sheep and Pleasant Valley dams on the lower Snake River early next year, PNP President Kinsey M. Robinson declares. If delays in licensing the power developments delay construction until next August, the dams will not be producing power until 1960.

Robinson said the region's power demands are increasing 500,000 kw a year—the equivalent of one Bonneville dam a year. "Certainly," he said, "the federal government is not able to take care of the region's entire utilities power load. Private and public utilities must take care of their share."

In a separate effort to stall off a power shortage, the Washington Power Commission is studying the feasibility of supplementing hydro power with steam, using local coal resources.

Rip in the Iron Curtain

Through a "controlled rip" in Russia's Iron Curtain, the West was informed that the U.S.S.R.'s sixth five-year plan includes an atomic construction program embodying a series of power stations using seven types of reactors—one of which will feed steam directly to the turbines.

A total of 2,500 Mw is planned. Two plants slated for the Ural area will have a total capacity of 1,000 Mw, said Prof Feinberg of the Moscow Research Institute of Atomic Energy. A 400 Mw station now is being built near Moscow.

Meter Museum

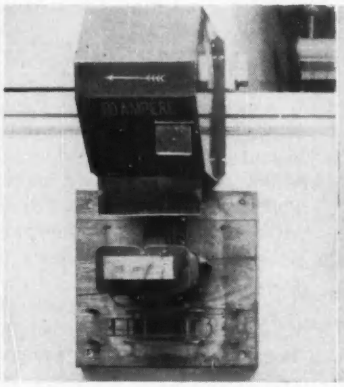
Relics from customer attics or basements and manufacturers' contributions make up popular Worcester exhibit that dates back to 1889. Utility plans to add other instruments

If today's meter reader happened into the New England Electric System's central laboratory at Worcester County (Mass.) Electric Co, he'd face a new demand on his ingenuity. In a departure from everyday problems of outwitting animals and man-made obstacles he'd face more than 100 meters resembling thermometers, altitude gauges, speedometers, and mileage indicators. He'd stare at from three to eight dials per meter or search for them in vain on other units.

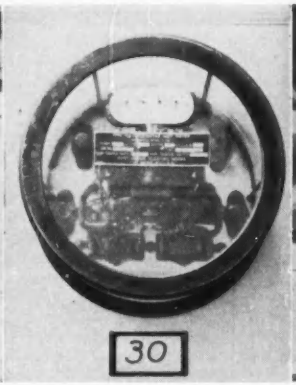
Although the meter reader's poise might be shaken, other visitors touring the museum can see the unusual scope of meter development over the years. The exhibit

THE OLDEST design on display—an Aron meter built in 1889 —is viewed by Lyman Salmonsen, co-curator of the museum

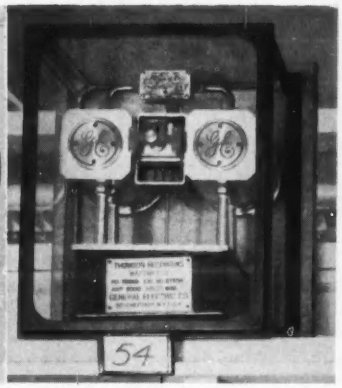
1890: Westinghouse Shallenberger current transformer type



1894: Ganz & Tarsa 100-amp, single phase ac



1902: Ft. Wayne 400-amp, 600-v polyphase integrating wattmeter

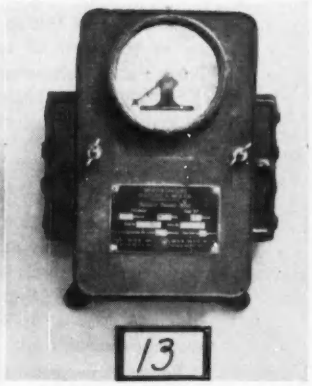


1904: General Electric 6,000-amp, 600-v dc wattmeter (Thomson)

No date: Weston 150-v voltmeter

1908: General Electric 5-amp, 100/110-v, single-phase ac induction meter

1911: Westinghouse 60-amp, 2,000-v, polyphase integrating wattmeter



1917: Westinghouse 75-amp, 2,000-v, polyphase watthour demand meter

Preserves the Past in New England

ranges from a 67-year-old, pendulum-type Aron ampere-hour dc unit, at left, to ac single-phase meters of today.

The collection began four years ago when Lyman Salmonsen, assistant engineer in the laboratory, and Frank A. Warburton, lab director, came across several old-time models. Some were found in customer's basements, closets, and storerooms. As the total grew and interest quickened, manufacturers joined the hunt.

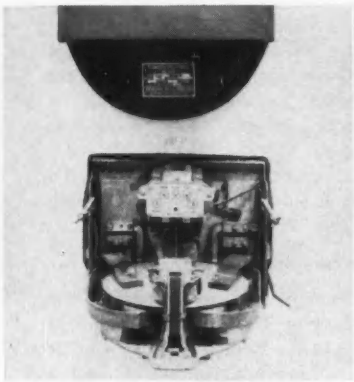
Duncan Electric Manufacturing Co, General Electric Co, Sangamo Electric Co, and Westinghouse Electric Corp are represented by models of each domestic meter produced for commercial use. Their grouped meters are wall-mounted underneath charts which depict the percent rated load and percent registration. Early models which dropped down to around 95% registration at 300% rated load are contrasted with current designs holding 100% registration to nearly 700% rated load.

Mounted above other meters are pictures of the men whose pioneering advanced the measurement art—Lanphier, Duncan, Edison, Shallenberger, and Thomson. Many of the meters carry manufacturers' names no longer familiar to contemporary metermen, such as Landis & Gyr, Sewickley Electric, and Ganz & Tarsa.

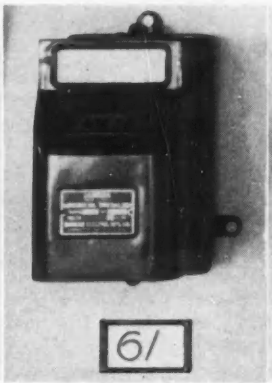
Searching for models of early meters of the O. B. Shallenberger ac design (similar to 1890, below), the Gutmann design of 1898, and other old timers continues to be a major objective.

In undertaking the collection, Salmonsen has accumulated details on watthour meter history. The one he inspects at top left was patented by Dr H. Aron on Dec. 13, 1887. When current flowed through the series coil under the permanent magnet pendulum, the pendulum swing speeded up in proportion to the current. The difference in rate of the mechanically wound pendulums was recorded on the differential register.

Interest in the museum has brought plans for adding other electrical equipment and instruments which played important roles in the utility industry's formative years.



1905: General Electric 75-amp, 220-v, 3-wire polyphase (Thomson)



1907: Duncan Electric Mfg 10-amp, 110/125-v, 2-wire dc integrating wattmeter

No date: Landis & Gyr 10-amp, 110-v, ac single phase

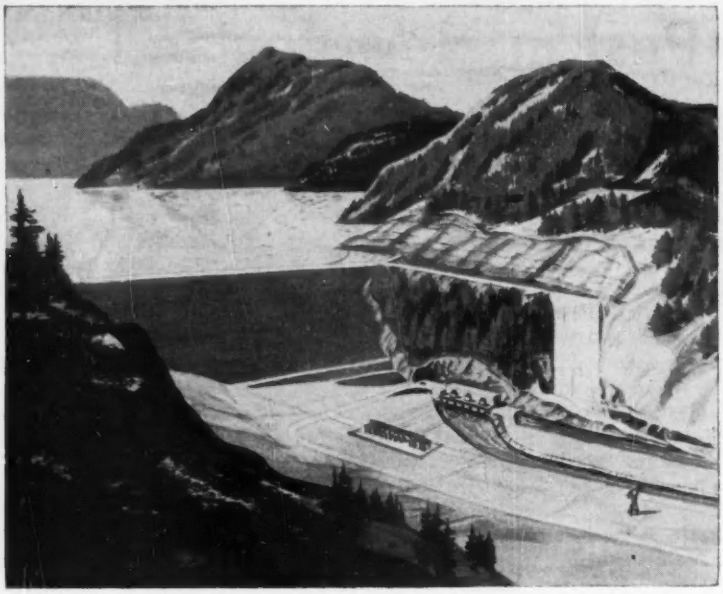
1907: Westinghouse 10-amp, 100-v, single-phase ac prepayment wattmeter

1929: Westinghouse 5-amp, 115-v, single-phase ac socket meter

1929: Sangamo thermal demand meter

1930: Landis & Gyr 5-amp, 110-v, polyphase trivector

1934: Sangamo 5-amp, 115-v, single-phase ac prepayment meter



PP&L to Start Giant Swift Dam

Earth fill structure seen to rise 510 ft high, to be joint project with Cowlitz County PUD

Construction of the highest earth fill dam in the world will be started this month by Pacific Power & Light Co as the third phase of its development of the Lewis River in southwest Washington.

The $56-million project, known as Swift Dam, is being undertaken in a joint development with neighboring Cowlitz County (Wash.) PUD, which will build a downstream No. 2 powerhouse. The rolled-earth structure will develop 256,000-kw of rated capability, of which about $15 million and 70,000-kw of the capability is represented by the Cowlitz PUD share.

Located upstream from the utility's Merwin and Yale projects, Swift Dam will contain 15-million cu yd of rock and earth and will rise 510 ft above the substructure excavation, already under way.

The 1,950-ft thick mass, which will stretch 2,100 ft across the gorge high in the western slope of the Cascade mountains about 45 mi north of Portland, Ore., will be four times the size of the Great Pyramid of Egypt.

Completion of the dam and of the spillway, which will be carved out of a mountain and parallel the normal streamflow with a forebay above the powerhouse on the river's east bank, is slated for mid-1958 when initial energy is slated for delivery.

Contract for $18,272,000 for the structure plus concrete-lined spillway (illustrated at right) and powerhouse excavation was recently awarded J. A. Jones Construction Co, Seattle and Charlotte, N. C., and Charles H. Tompkins Co, Washington, D. C.

Diversion of the Lewis River through a 2,900-ft, $1.8-million tunnel 32 ft in diameter was achieved recently under contract by Guy F. Atkinson Co, South San Francisco.

PP&L's Merwin Dam the oldest in its Lewis River utilization program, has a 100,000-kw capacity and is presently earmarked for installation of another 45,000-kw generator for which space was provided a number of years ago.

Under investigation are projects to bring into development up to 200,000-kw of additional capability. These are at the Muddy site, which is at the head of the reservoir to be created by Swift Dam, and the high Cascade Meadows site, involving several mountain streams fed by glaciers and snows of Mt. Adams. The latter would have some of the highest head capabilities of any existing project in the world.

Memphis to Build

Plans large bond sale for municipal steam plant; promises low cost power

In a move to supply relatively low cost electric power to meet a "phenomenal" demand growth, the city of Memphis (Tenn.) has announced it will issue $154 million of electric revenue bonds to finance the construction of an 812,500-kw municipal steam plant.

The plant, described as "the largest single project of its kind ever constructed by any community in the world," is the initial undertaking in a long-range financial program through 1965.

Mayor Edmund Orgill said the three-unit plant will supply power to the city at the same relative rates to consumers as prevailed under the city's purchase of Tennessee Valley Authority power.

The city now pays about 4 mills per kwhr for TVA power. Orgill estimated the cost to Memphis of generating its own power in 1962 at about 4.3 to 4.4 mills. This, he said, would compare favorably with TVA's probable future rates in view of rising fuel and other costs.

Interchange Pact Signed

Although the city's contract for purchase of TVA power will end in June, 1958, Memphis Light, Gas & Water has signed a power agreement with TVA which provides that whenever either can supply the lower cost electricity, the other would have access to it. The pact also assures Memphis that TVA would serve Memphis until its municipal plant is in adequate operation.

The new plant will be located on McKellar Lake, near a new harbor and industrial development area. The first of three units is slated to go into operation in the summer of 1958; the second, December, 1958; and the third in February of 1959.

Citing the need for the new plant, a feasibility report prepared by Burns & Roe, consulting engineers, said that population in Memphis area rose 81% over the past 25 years. It said the community's electrical needs, estimated at 1.8-billion kwhr in 1955, will reach almost 7 billion kwhr by 1965.

He's weighing the proper flux density into a POLE STAR core . . .

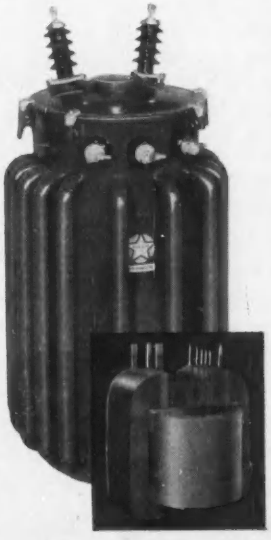
Checking the weight of Pole Star cores requires but a momentary stop on the conveyor line — a pause that pays off in core uniformity and positive assurance of low flux density.

Here's why...

Flux density of the core (number of magnetic lines per square centimeter) is worth dollars and cents to the user of distribution transformers. High flux density means high exciting current, which, when multiplied by hundreds or thousands of transformers on the line, can increase distribution costs.

Because flux density is dependent upon the amount of steel used in the core, Pennsylvania Transformer Company has set up an effective system of checks to make certain that every lap-on-top Pole Star core contains the proper amount of steel. Laminations are counted, the core is measured, and then — because there can be minute but important variations in the steel itself — the core is *weighed* to provide a beyond-a-shadow proof that the *right* amount of steel has been used in each Pole Star core.*

That's why, with Pole Stars, you get proper flux density and low exciting current *every time.*



**This extra precaution precludes, for example, any possible variations in the cores as a result of slight "wrinkles" in the steel, or as a result of otherwise unnoticeable discrepancies in the insulating coating of the steel.*

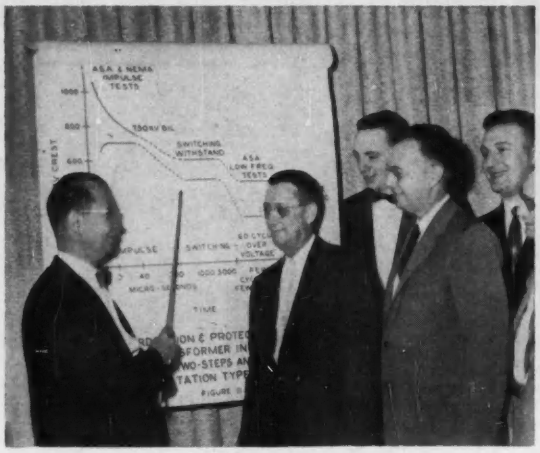
167 Production Controls make Pole Star best!

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PA. Greater Pittsburgh District

Pole Star Transformers are available in all standard single phase distribution sizes from 3 through 500 kva, through 67,000 volts.



H. G. FRUS, sponsor of reduced insulation symposium, questions J. R. Meador, J. B. Owens, F. W. A. Meyers, M. C. Galiyano, and C. W. Miller who participated

J. R. STOVER describes New York E&G's Milliken unit to Committee Chairman E. M. Gue (Duquesne Light Co), Vice Chairman Paul Robbins (Metropolitan Edison Co)

PEA Told Reduced Insulation Gains

Electrical Equipment Committee, meeting at Binghamton, N. Y., hears BIL cut saved half million on 1,300-Mva of substation transformers

Reduced insulation on 1,300 Mva of substation transformers saved more than a half-million dollars on the Pennsylvania Power & Light Co system during the past five years, M. C. Galiyano told the Pennsylvania Electric Association Electrical Equipment Committee recently at Binghamton, N. Y. Another quarter million dollars was saved by using one-step-reduced insulation on switchgear and bus at six substations.

One-step-reduced insulation on 138-kv equipment, he said, has proved successful. Consequently, he added, the company's latest transformer purchases will include 150 Mva of two-step-reduced 220-kv units and a similar amount of 115-kv transformers with one-step-reduced insulation.

Insulation Reduced

Design specifications for the new Lancaster substation, Galiyano said, drop from the fully-insulated 220-kv line to 196-kv switchgear, and thence to 220-66-12-kv transformers insulated on the high side for 161 kv. He added that lightning arresters rated 182 kv provide an adequate margin under lightning voltage, switching surges, and 60-cps over-voltage.

Philadelphia Electric Co has likewise adopted reduced insulation for 230-kv transformers, F. W. A. Meyers reported, adding that the company's choice has been 1½ steps down following six years' experience with one step. He said that the additional half step on the 230-kv windings of two 200-Mva auto transformers, coupled with one-step reduction on their 138-kv tap, saved about 6% in transformer cost and appreciably lowered the losses.

Less Weight Eases Hauling

The associated weight reduction, Meyers continued, facilitated highway hauling to substation sites. Evaluation of the slight cut in protective margin in the 1½-step design, demonstrated the adequacy of its 825 BIL. But reduction to 750 BIL has been deferred.

Outdoor air switches have not entirely matched the BIL reduction in substation transformers and circuit breakers, it was suggested by J. B. Owens, R&IE Equipment Division of I-T-E Circuit Breaker Co. He noted that switch insulation for 115-kv systems has been almost exclusively 550 BIL and that a lack of 650 BIL insulators led many utilities to use 115-kv switches and bus supports for 138-kv service. But recent announcement of 650 BIL apparatus insulators will enable introduction of 138-kv switches.

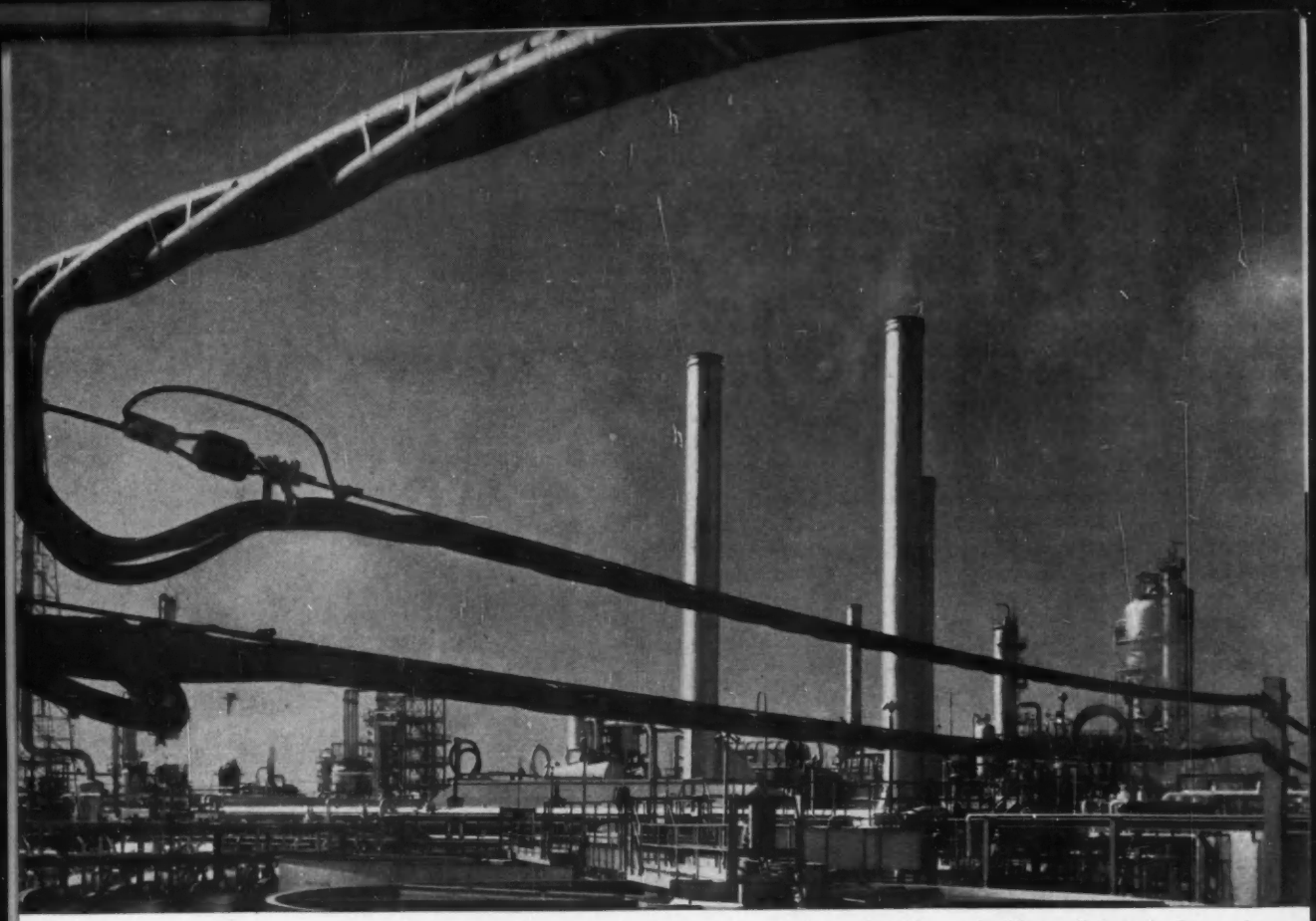
Practically all apparatus in service at 161-kv has 750 BIL, but the new 650 BIL insulators provide opportunity for insulation reduction, Owens said. He noted that 230-kv stations are usually insulated at 900 BIL with five-high insulator assemblies. He warned that switches depended upon to de-energize equipment for working clearance must have surge protection preventing surges from reaching them which exceed their open-gap strength.

J. R. Meador, General Electric Co, and C. W. Miller, Westinghouse Electric Corp, traced the evolution of reduced insulation and indicated that today's trend is a direct reflection of improvements in lightning protection. Meador reviewed advances in testing techniques and knowledge of insulating oil as a factor in insulation utilization. Miller suggested that insulation reduction in some autotransformer designs could bring savings greater than those for conventional units disclosed by other speakers.

Advises on Motors

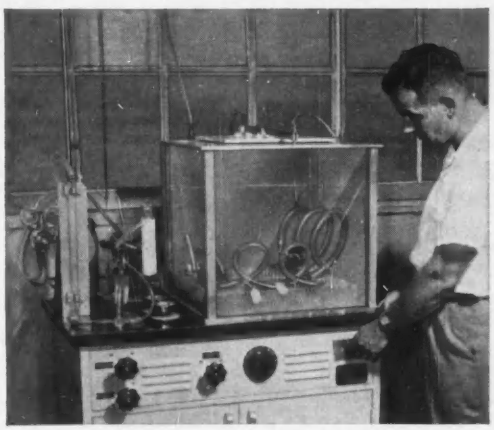
The motor manufacturer should be told the speed-torque requirements of equipment to be accelerated, along with load variations during normal operation, said A. E. Beardmore, General Electric. The duty cycle of frequently started drives, he said, is

(*Continued on page* 24)



Anaconda 15 kv aerial cable installed at oil refinery.

New high-voltage cable cracks the ozone barrier



SAMPLES of Type AB insulated cable bent in small circles are placed in ozone chamber for ozone-resistance test.

Butyl insulation in Anaconda Cable exceeds ozone-resistance test requirements by 2400%

Under high electric stress, minute particles of air break down, form corona. This generates ozone which may combine with the rubber hydrocarbon of the insulation. Without superior ozone resistance, the insulation fails.

But now you can get extra protection against ozone—and ozone damage—with Anaconda Type AB butyl-insulated cable. This insulation is compounded for *inherent* ozone resistance along with other desirable properties.

In standard ozone-chamber test, Type AB insulation (after aging) shows no injury after 72 hours in 0.025-0.030% ozone concentration . . . 24 times longer than required by oil base and butyl specifications.

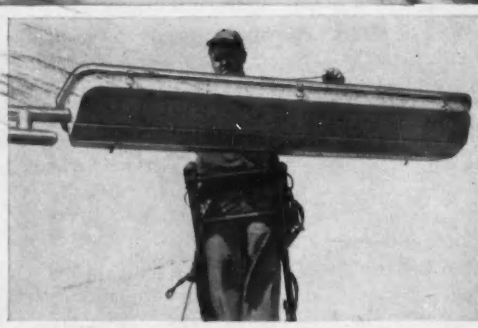
New Engineering Bulletin EB-27 gives full details on performance of Type AB insulation in 15 Industry Specification Tests. See the Man from Anaconda or write: Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

SEE THE MAN FROM ANACONDA®

pioneer in BUTYL INSULATION

"NOTHING TO IT!...Putting Up the

CARL HAWKINSON
Superintendent
Edwards Construction
Company
Geneseo, Illinois



"Nothing to it," says "Swede" Hawkinson. "First, slip the aluminum housing over the 2-inch support member and turn the housing *upside down*. Easy going—you're on *top* of the job, and in good working position—not underneath, working up like you are on other units."

"Hook up the primary. Terminals have tin-plated pressure-pad connectors to speed up the installation. The reflector assembly mounts on the housing with just three cotter-type hinge pins. Now, flip the reflector open to connect the leads. And see how the friction-type connectors save time."

LM®

LINE MATERIAL

A McGRAW ELECTRIC COMPANY DIVISION

New L-M Fluorescent Luminaire Is Easy!"

That's the word from Carl "Swede" Hawkinson. "Nothing to it... one man can do the job. All you need is a screwdriver, a crescent wrench, and a level."

For a fact, the new L-M fluorescent luminaire is *remarkably* easy to install. You will understand why, as you study the photographs and explanation by "Swede" Hawkinson, competent and well-liked superintendent of the Edwards Construction Company, Geneseo, Illinois.

And bear in mind—this easy-to-install design by L-M offers *many* exclusive engineering advantages. In addition, L-M's new fluorescent luminaires present a *new look* in street-lighting equipment. They are styled for handsome appearance, correct light distribution, and a lifetime of efficient, economical operation.

Outstanding Features of L-M's New 1957-Style Fluorescent Luminaire

Shipping: Unit comes in two separate packages to make it easy to handle. The housing is in one package; globe and reflector assembly are in the other.

Housing: One-piece aluminum housing with reinforcing ribs provides strong, rigid mounting. Aluminum housing also provides excellent heat dissipation. Neoprene gaskets seal globe to housing and support entry, provide weatherproof construction.

Ballasts: Ballasts are mounted directly to flat inner surface of aluminum housing. This allows maximum heat dissipation during operation.

Ballast leads have friction-type terminals. Wiring is completed quickly and easily without tools.

4-lamp units have two ballasts, with one lamp from each side paired to each ballast.

Reflector: Two-piece reflector has separate, efficient reflecting surface for each lamp. Assembly is hinged and retained by spring-type latches to provide easy access to input terminals, ballasts, internal wiring, and mounting clamps.

Opening or removal of reflector assembly is accomplished without removal of lamps from their sockets.

Lamps: Only unit available today designed to take both present and future very high output (VHO) fluorescent lamps.

Globe: One-piece Plexiglas® globe is strong, virtually free from strain. Unit is latched and hinged to open from either side to provide easy accessibility for installation, wiring, cleaning, or relamping. "Breather" holes are provided in bottom of globe. Holes are covered with fiber glass filters to keep out dust and insects.

Wiring: Input terminals accommodate wire up to No. 4 stranded. They are tin-plated for use with either copper or aluminum conductor. Input circuit is arranged for operation on either 2- or 3-wire system.

Get Complete Information

Ask your L-M Field Engineer or Street Lighting Engineer for more complete information. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

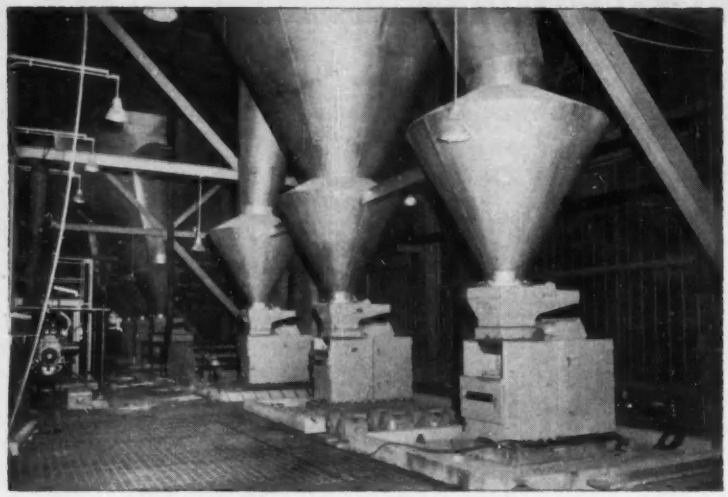
Shallow-type luminaire

Shallow type is available in 4- and 6-foot lengths to accommodate 2 or 4 lamps. The deep style shown in photos below is also available in 4- and 6-foot lengths. For other outdoor lighting applications, such as parking lots, store-front lighting, etc., other styles are available. L-M Street Lighting Engineers will cooperate with you in designing the best system for your area.

"Next, turn the whole assembly 180° to normal position. Level and tighten up two interior clamping screws, and lock the reflector assembly in place with three twist-lock hasps. The two-piece reflector has separate reflecting surfaces for each lamp."

"All right! Now you put in the four fluorescent lamps, swing the globe assembly up into latched position, and the unit is ready to be fired up. The whole installation can be done in a matter of minutes. *Nothing to it!*... Putting up the L-M Fluorescent Luminaire is *easy!*"

Street Lighting



DP&L's New Plant to Use Fluid Coke

Use of a unique fuel—fluid coke—is planned for Delaware Power & Light Co's new generating plant being built near Delaware City. The coke, a solid residual product of Tidewater Oil Co's nearby refinery, will be pulverized and stored in huge funnel shaped hoppers (above). Blown on an air stream, the powdered coke acts like a fluid and will be fed directly into the power plant's boiler furnaces. These will produce high-pressure steam which will activate the plant's electric generators to produce power chiefly for the refinery.

Construction of Dalles Dam Progresses

Work is progressing in giant strides on The Dalles Dam, $260-million multi-purpose project of the Army Engineers on the Columbia River. Above photo shows the entrance to old Dalles-Celilo canal (in foreground), the east fish ladder, a concrete non-overflow section, power house, another concrete non-overflow section, and the spillway dam across the river. At right of the spillway dam is Dalles' navigation lock. Final closure of the river, to be located in right foreground between entrance to canal and concrete non-overflow section, is slated for March 1.

Reduced Insulation Gains

(*Continued from page* 20)

also important because it imposes more severe motor heating. Although hydraulic or magnetic couplings should be unloaded for motor starting, the motor should remain capable of emergency starting under load.

Noting that full-voltage starting causes less motor heating than reduced voltage, Beardmore advocated design of station power supplies for full-voltage starting and balanced voltage to give maximum torque and minimum heating. Motor design for operation at unreasonably low voltage takes its toll in starting current or efficiency.

Asks Air-Filter Plugging Signal

Beardmore pointed out that live transfer to an alternative power supply minimizes stress on motors and driven equipment. Automatic open-circuit transfers should be delayed by a voltage relay set for a residual 25% of rated voltage. He closed by urging use of an indicator to warn of air-filter plugging on weather-protected motors.

Meyers of Philadelphia Electric spoke also on the auxiliary requirements of the two 325-Mva supercritical units at Eddystone Station. Such requirements will be 27 and 25 Mva for the No. 1 and 2 units, respectively, and in addition each unit will have two 5,000-hp, turbine-driven, high-pressure feed pumps.

Power Supply Described

Power supply for each will be two 12/16-Mva transformers, connected directly to the high-pressure and low-pressure generator leads, said Meyers. He added that starting power for the station, two 15/20-Mva transformers supplied from the 138-kv system, was designed to start the 4,000 and 4,500-hp boiler feed pumps with less than 20% voltage dip.

Meyers noted that simplicity and few emergency feeds mark the auxiliary system plan. The 4-kv buses are close to their loads, and the loss of any turbine auxiliary bus will shut down its main unit. The latter limitation was preferred to automatic transfers or sequential restoration, careful review of major equipment indicating that thermal shock would not be too serious.

Battling a Bad Actor:

INSULATOR CORROSION

Corrosion has always been an especially bad actor on insulator hardware located in contaminated industrial areas, in railroad tunnels, near the oceans.

To stop the destructive antics of corrosion and to give you insulators capable of withstanding atmospheric attacks in industrial and sea coast areas, General Electric employs the best known materials and protective techniques. Among these are:

Strenicor—a special copper base alloy which minimizes stress corrosion of insulator ball bolts, even under most severe conditions.

Aluminized Hardware—hot-dip aluminized insulator caps and ball bolts provide exceptionally good resistance to sulfurous fumes. Now in developmental stage.

Stainless Steel—Insulator hardware made of this metal gives excellent performance in salt spray and under a variety of chemical fumes. Proven in years of controlled application.

Galvanized Coatings—These provide good all-around protection for malleable iron, forged and drawn steel. The most modern methods are employed in our new galvanizing facilities.

These and other anti-corrosion developments are available to you as a result of our continuing effort to give you Locke* insulators with hardware durability to match the great life span of today's fine electrical porcelain. Insulator Department, General Electric Company, Baltimore, Maryland.

*Trademark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

OFFICERS APPOINTED were F. J. Kripps, vice chairman, and J. K. Babbitt, chairman, association's Electrical Operating Section; and Rex S. Hovey, vice chairman, and A. A. Pfingsten, chairman of group's Electrical Sales Section

Wisconsin Utilities Group Names Officers

Milwaukee meeting also hears static devices are increasing on power systems and gets description of heavy-water nuclear reactor design

The magnetic amplifier, Cypak, and transistor are more and more becoming components of growing power systems, E. R. Taylor, Westinghouse Electric Corp, told the Wisconsin Utilities Association at its convention Oct. 17 through 19 at Milwaukee. Taylor pointed out that the magnetic amplifier is used today for generator voltage regulation, the Cypak for totalizing loads on line and facilitating generator loading, and the transistor for making carrier current equipment more compact.

The convention appointed new officers of its sections. J. K. Babbitt, Wisconsin Michigan Power Co, was named chairman of the Electric Operating Section, succeeding F. D. Mackie, Madison Gas & Electric Co, and F. J. Kripps, Northern States Power Co, succeeds Babbitt as vice chairman.

Others Appointed

A. A. Pfingsten, Wisconsin Public Service Corp, succeeds Almer Skretting, Wisconsin Electric Power Co, as chairman of the Electric Sales Section. R. S. Hovey, Northern States Power Co, has Pfingsten's former post as sectional vice chairman.

F. W. McCloska, Sargent & Lundy, described the design of a heavy-water nuclear reactor which could produce 150 Mw of heat and 40 to 60 Mw of power. This 870-psig reactor, he said, requires a minimum of equipment in the containment vessel.

Operational experience proved the wisdom of automatic protection against loss of excitation for a 120-Mw unit at Oak Creek Station, the conference was told by N. A. Ricci, Wisconsin Electric Power Co. He described instances in which such protection helped minimize troubles during system disturbances.

Studies of high flashover rates on new transmission lines have revealed some common factors, N. R. Schultz, General Electric Co, declared. These factors are steel tower lines of double-circuit construction with a single shield wire and relatively low tower-footing resistances, he said, noting that most of the flashovers reported were on the top phases.

Studies of switching surge withstand strength of transformer insulation shows it to be 130% of the 60-cps hipot strength, said I. B. Johnson, General Electric, pointing out the relation of this finding to possible reduced BIL.

Improved aerial survey techniques are now able to obtain elevation data for determining tower-leg lengths for H-frame and steel-tower transmission lines, said G. D. Hardy, Abrams Aerial Survey Corp. Aerial surveys help in selection of routes and in reduction of field work.

Wisconsin Electric Power today designs substations with a view to reducing noise level and improving appearance, asserted R. I. Powers. The company is using landscaping extensively, particularly where open-type designs are followed.

A special night valley rate has boosted Wisconsin Power & Light Co water heater sales by 30%, revealed M. R. Norton. The rate is 75¢ per month plus ¾¢ per kwhr, and the company requires a minimum of 100 gal of water heater capacity. Charging time is between 10 PM and 7 AM.

Appliance Sales Up

Wisconsin Michigan Power has improved appliance sales and obtained the enthusiastic support of dealers through a cooperative advertising campaign, J. J. McLean related. The company buys a large ad in the center of a page or two-page spread, and the dealers take the surrounding space for their own ads.

A $25 allowance on bottled-gas stoves and water heaters replaced by electric equipment is offered dealers by Wisconsin Public Service Corp, said A. G. Blitz. The program, in effect 20 months, has replaced 1,083 appliances.

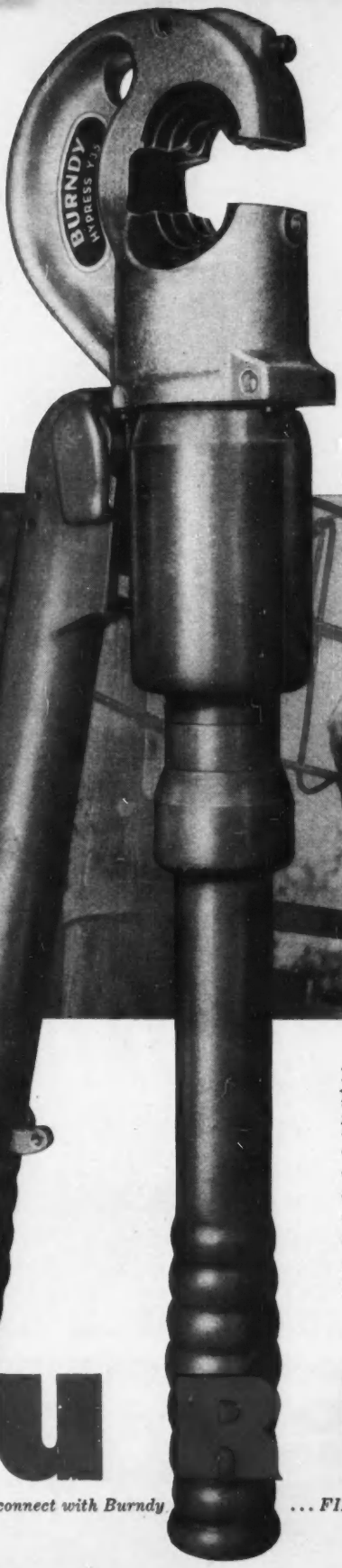
taps and splices

copper
ACSR
aluminum
steel and
copperweld

NOW...

BURNDY PUTS 12 TONS IN YOUR HANDS

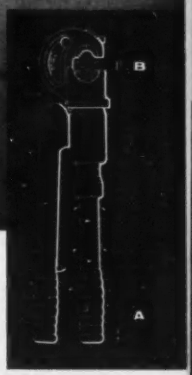
Y35 HYPRESS



all BURNDY compression connectors for overhead lines may be installed with the Y35 HYPRESS including

- CRIMPITS
- HYSPLICES
- DEADENDS
- ELTAPS
- LINKITS
- BYTAPS
- T-TAPS

SIMPLIFIED DIE INSERTION — Identical interchangeable head and ram dies easily inserted and locked in position so that HYPRESS can be moved along connector without movement of dies.



QUICK RAM ADVANCE — Clockwise rotation of handle (A) moves die up to grip connector (B). Installation is completed by pumping until built-in overload valve clicks open. Trigger returns die to pre-set position.

Burndy developed and produced the first portable hydraulic HYPRESS in 1938. Experience and field usage since that time has made these features possible:

- **Lightweight — weighs only 12 pounds**
- **Head Rotatable 180°**
- **Neoprene Insulated Body and Handles**
- **Crimping Die Release Trigger on Handle**
- **Sealed Hydraulic System**

For further details or demonstration, contact your Burndy representative or write Burndy, Norwalk, Connect. — Toronto, Ontario for instruction manual.

BURNDY

55-6

It's good business to connect with Burndy ... FIRST name in electrical connectors; tools; methods

NETWORK
TRANSFORMERS
Low-height permits small vaults

NEW LOW HEIGHT

makes General Electric network transformers ideal for Illinois Power Company's new system

The new General Electric network transformers, recently selected by the Illinois Power Company for its first secondary network system at Decatur, Illinois, stand only 61 inches high.

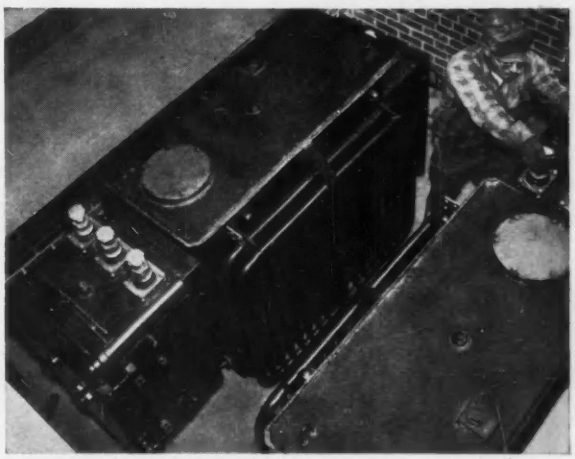
Such low height makes it possible to reduce vault size to the minimum, reducing construction costs. Or you can take advantage of the low height to install additional equipment in a normal-size vault. Illinois Power, for example, selected G-E units to permit installing rack-mounted secondary capacitors if load growth requires additional capacity in the future.

OTHER ADVANTAGES—New G-E low-height network transformers also offer simplified maintenance and increased reliability. You can easily clean the tubes, for example, by pushing a long-handled brush between the banks of radiator tubes, either from the top or from the ends of the transformers. And you can repaint the transformers in the same way.

The new transformers offer increased reliability because wing design reduces the chance for corrosion to start. Radiating surfaces are mostly vertical, not horizontal, and corrosive elements—water, sewage, etc.—do not readily collect on the radiators. Furthermore, the units feature balanced thermal design, giving reduced hottest-spot temperature rises throughout the transformer core-and-coil structure for increased transformer life.

FOR HELP in solving your network problems and for complete information on the advantages of low-height G-E network transformers, see your local G-E sales representative. General Electric Company, Schenectady, N. Y. 435-8

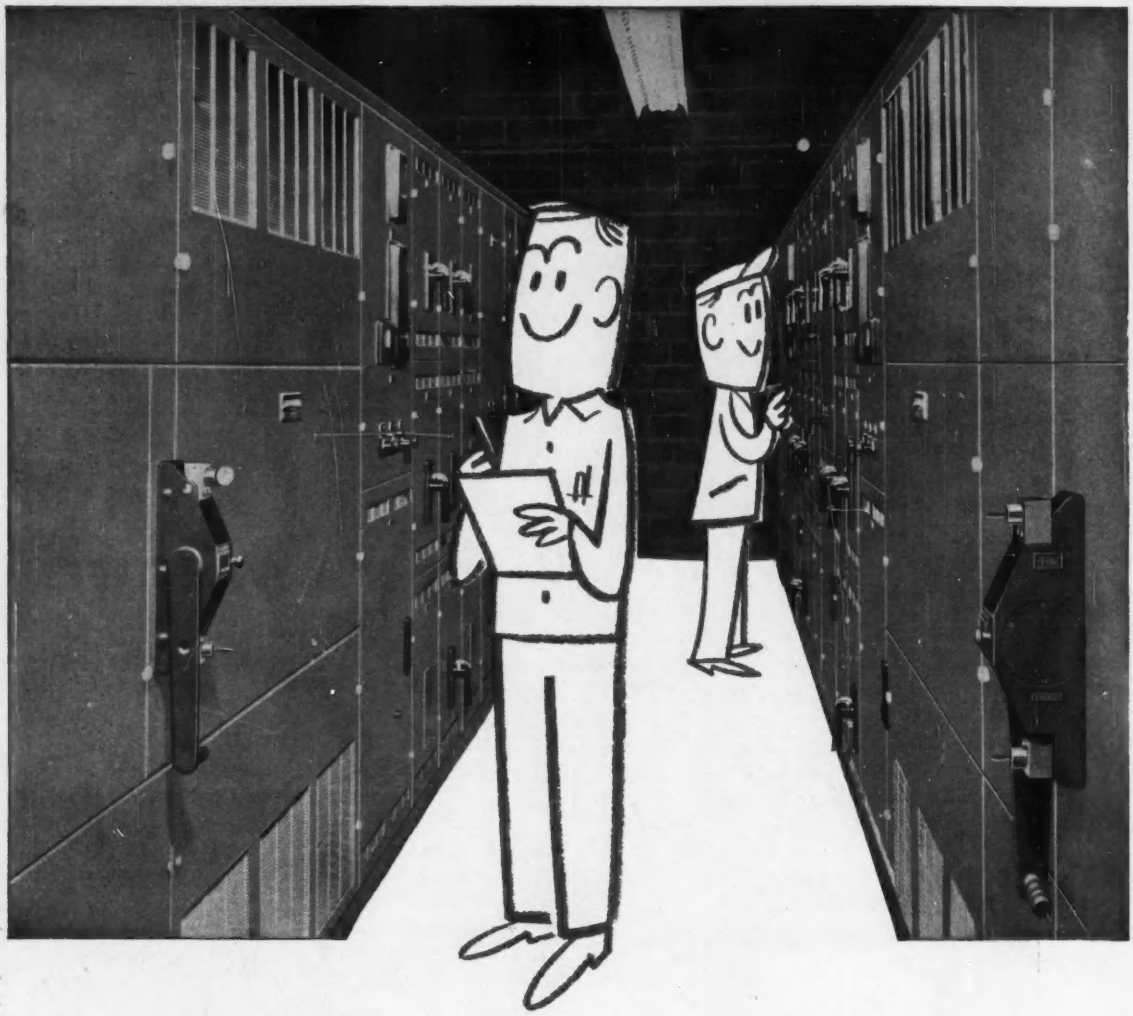
FIRST OF FOUR General Electric low-height network transformers to be installed in the largest vault on new network system of Illinois Power Co.



CONNECTING CABLES to network protector. Compact low-height design allows for future installation of secondary network capacitors in minimum vault space. This saves on construction costs.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Bring dependable electric power nearer to where you use it —install an **I-T-E** Secondary Unit Substation in your plant

I-T-E Secondary Unit Substations make electric power more dependable, more economical. They bring higher voltages nearer the load, reduce power losses. They increase machine efficiency, reduce voltage drops inherent in long low-voltage runs. They save space—all necessary components are housed in one functionally designed unit. They protect plant personnel—all live parts are isolated and metal enclosed.

In addition, you save in delivery and installation time. All I-T-E Secondary Unit Substations are assembled, tested and shipped ready to install from one source of supply. And they are available for any application, indoor or outdoor, in any standard rating.

For complete information, contact your nearest I-T-E sales office. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division

Utilities Disclose High-Voltage Cable Practices

Wood-pole transmission, packaged air conditioners, and safety were other important topics on program at meeting of EEI T&D Committee

High-voltage cable, wood-pole transmission, and packaged air conditioners shared attention of Edison Electric Institute's Transmission and Distribution Committee at Buffalo recently.

Oil-filled 230-kv buried cable has been selected for the 1,500-ft connections from the main transformers of new 240-Mva generators to the switchyard, at Huntley Station, reported J. M. Geiger in a paper prepared jointly with C. T. Nicholson. Use of cable was dictated by lack of space for additional overhead circuits. The normal-pressure oil-filled type was selected in preference to high-pressure pipe type for these reasons:

Selection Explained

1. Installing oil-filled cable uses skills already possessed by company crews which have not had pipe-cable experience.

2. Buying the cable in 1,500-ft lengths eliminates splices and confines jointing to terminals where work can be supervised closely.

3. Using single-conductor cables avoids the trifurcation problems of pipe-type cable.

4. Placing a polyethylene jacket over the lead sheath protects it adequately against mechanical injury during installation.

5. Maintaining oil pressure is easy with reservoirs at 30 ft elevation where the pipe-type would require pumps to maintain operating pressure.

6. Reliability records are more favorable to oil-filled cable.

7. Restoring service after cable failure will be expedited with a complete spare conductor placed during initial installation. This minimizes down time for the 240-Mva generator.

8. Capability of 1,250-MCM oil-filled cable is adequate where 1,500-MCM would be needed in pipe.

Sheath Will Be Fluted

The 1,500-MCM cable selected for this job, continued Geiger, will have a ½-in. hollow center and 835 mils of paper insulation. Its 160-mil arsenical-lead sheath will be fluted internally for improved oil circulation and protected by 115-mil jacket of high-molecular black polyethylene. These 3.92-in. cables will be spaced at 8-in. centers in high density sand in a 5-ft trench. Perforated fiber pipes will water the sand whenever temperature rise of the cable sheath indicates the need, and concrete slabs in the backfill guard against mechanical injury.

Pipe-type cables operated near their capability ratings during the summer should be checked frequently for temperature rise, advised W. O. Smith, Long Island Lighting Co. He cited several cases where loss of moisture of adjacent soil permitted cable temperature to exceed acceptable limits and load was curtailed to save the cable. In one case involving an 11-mi, 69-kv, 2,000-MCM cable circuit pulled in 6⅝-in. OD steel pipe, buried 3.5 ft, one of 15 thermocouples on a routine test indicated pipe temperature slightly above the 50C normal limit. Readings the following day reached the 60C emergency limit and switching was carried out to reduce cable loading. Curtailment was continued until rainfall restored moisture to the soil, after which the cable again carried normal load without exceeding temperature limits. Visual inspection of the soil during the curtailment period disclosed a 1-ft jacket of dry soil completely surrounding the pipe, Smith said.

Will Carry 125 Mva

In discussion, J. A. Pulsford, Public Service E&G Co, described a 138-kv, 2,000-MCM pipe cable installation under construction to carry 125 Mva. Load will be curtailed in case of prolonged drought.

Soil research by Dr Winterkorn and his staff indicates insufficient densification of the soil and low moisture content can contribute to cable hot spots, reported H. E. Cody, Cleveland Electric Illuminating Co.

Cable in tile duct on a stone highway bridge posed a problem when it became necessary to replace a sidewalk over the duct line, reported G. H. Fiedler, Rochester G&E Co. Solution was found in exposing the cable and lashing split non-metallic conduit around it with copper wire. Pouring the new concrete walk encased the duct line.

In discussion, H. L. Davis, Jr., Philadelphia Electric Co, and several others told of negotiating to have ducts cast into prestressed concrete members for highway bridges.

Demonstrates Joint

Self-curing, thermo-setting plastics are now used almost exclusively on Consolidated Edison Co's 4-kv aerial cable, reported L. Falkenstein. The conductor is jointed with a compression sleeve before the insulation is applied. Falkenstein demonstrated the ease of this joint technique by completing a joint at the rostrum, pointing out that workmen are easily taught the new method. The same methods are applicable to neoprene-covered rubber, lead-covered rubber, and lead-covered paper underground cable.

Unique features of a new 115-kv H-frame line designed for ultimate operation at 230 kv were described by J. R. Stover, New York State E&G Co. Conductors for this line are 795 MCM 45/7 ACSR sagged to 43.6% of ultimate by NESC heavy loading. The two shield wires are ⅜-in. EHS galvanized steel. Conductors and shield wires have armor rods to minimize effect of vibration. Conductor uplift at some structures was overcome by hanging 50 to 350 lb of cast-iron weights on the conductor clamps.

Impulse Strength 1,100 Kv

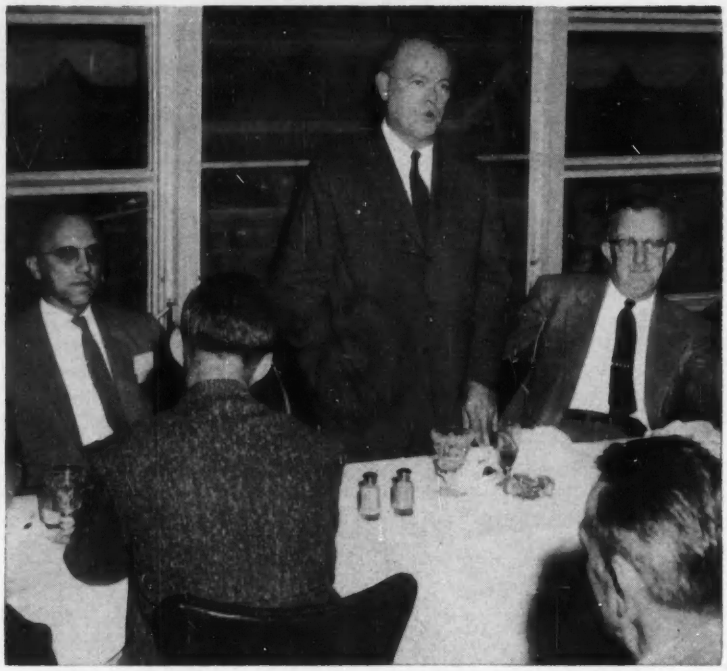
H-structures to support this line are X-braced and knee-braced for rigidity. The 40-ft Douglas fir crossarms were surfaced to 7¾ x 7¾ in. before drilling, incising, and pressure treating with 5% pentachlorophenol. These arms are knee-braced both ways to make rigid trusses, and bolted to the poles with special hardware. Destructive full-scale tests proved ability to support 6,000 lb vertical and 14,000 lb transverse loading, equivalent to 8½ lb wind on 1½-in. radial ice for 1,000-ft spans.

Impulse strength for the line is 1,100 kv with 20-ohm footings, said Stover. Policy is to omit counterpoise but to

(*Continued on page* 36)

PEA Prime Mover Group LILCO Guests

Gets views on water treatment at new plants from New York to Oregon



W. WELCH JR, assistant vice president, Long Island Lighting Co, welcomes Prime Movers Committee. At his left is J. G. Miller, Metropolitan Edison Co, committee chairman; at his right, A. C. Hartranft, Philadelphia Electric Co, who is chairman of the PEA Engineering Section. Meeting was held Oct. 18 and 19

The turbine heat rate at West Penn Power Co's new Armstrong Station was improved through the use of a demineralizer for water treatment, J. E. Davis told the Oct. 18-19 meeting of the Pennsylvania Electric Association's Prime Movers Committee. Long Island Lighting Co was host to the committee one day at its Hicksville headquarters and on the other at its new Barrett Station.

His company, said Davis, preferred the demineralizer to an evaporator for the initial unit, rated 165 Mw with steam conditions at 1,800 psi, 1,000/-1,000F. A water treatment study, he said, showed that the demineralizer improved the turbine heat rate by 0.2%. Although sized for two units, only enough resin will be provided for the first unit.

Favors Demineralization

J. S. Bartman, Metropolitan Edison Co, said that demineralization was the more practical and economic treatment for makeup water. Such makeup water, he said, should contain solids totaling about 0.1 ppm, this purity being obtainable only by double evaporation or demineralization. He said this degree of purity, even without blowdown from the system, gives steam purity satisfactory for once-through boiler use at the new Portland, Pa., station.

At that station, two demineralizer chains will be installed, each consisting of a cation, an anion, and a mixed-bed polishing unit. Internal treatment will be hydrazine for oxygen scavenging and either ammonia or morpholine for pH control. To obtain an absolutely tight condenser, condenser tubes will be welded to the tube sheet.

Long Island Lighting, however, will have an evaporator system with sodium zeolite pretreatment at its Barrett Station. Thus said A. T. Jorgensen describing equipment having a 17,000-lb-per-hr capacity. Although a demineralizer promised a 9 to 12-Btu more favorable heat rate, its overall cost was higher too. Chemicals for it would cost 8¢ per 1,000 gal of treated water compared with 1¢ for the sodium zeolite and about 5½¢ for a hydrogen zeolite system. Studies showed a $7,500 net saving through the equipment selected.

R. I. Smith, Public Service Electric & Gas Co, pointed out that his company treats all high-pressure units as though they were supercritical. Ammonia and hydrazine, he said, were the only internal treatment at Burlington No. 7 for the past year. Results have been favorable, and these chemicals will be used at the new Linden Plant where they will be added to the cycle at the condensate suction point. Demineralization will be used to treat makeup water.

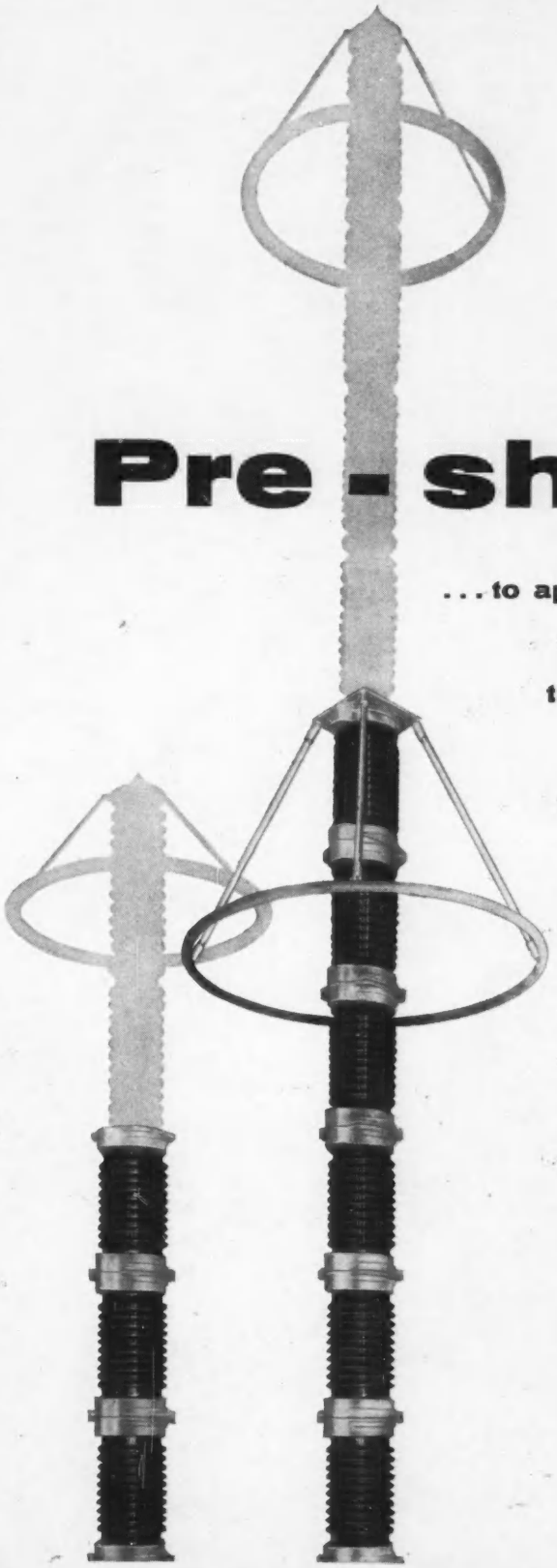
Rinsing Technique Developed

A sub-surface rinsing technique has been developed by Philadelphia Electric Co for removing material adhering to the resin in the demineralizer, reported V. B. Burgess. The rinsing has improved equipment operation, helping to maintain it at full capacity. He indicated the new Eddystone supercritical-pressure plant would get demineralizers.

Both evaporators and demineralizers give satisfactory boiler water, declared E. P. Partridge, Hall Laboratory, Pittsburgh. But larger evaporators, or evaporators especially equipped, are sometimes necessary to obtain water like that from a demineralizer.

Partridge pointed out that a demineralizer's performance depends considerably on the amount of pre-

(*Continued on page* 36)



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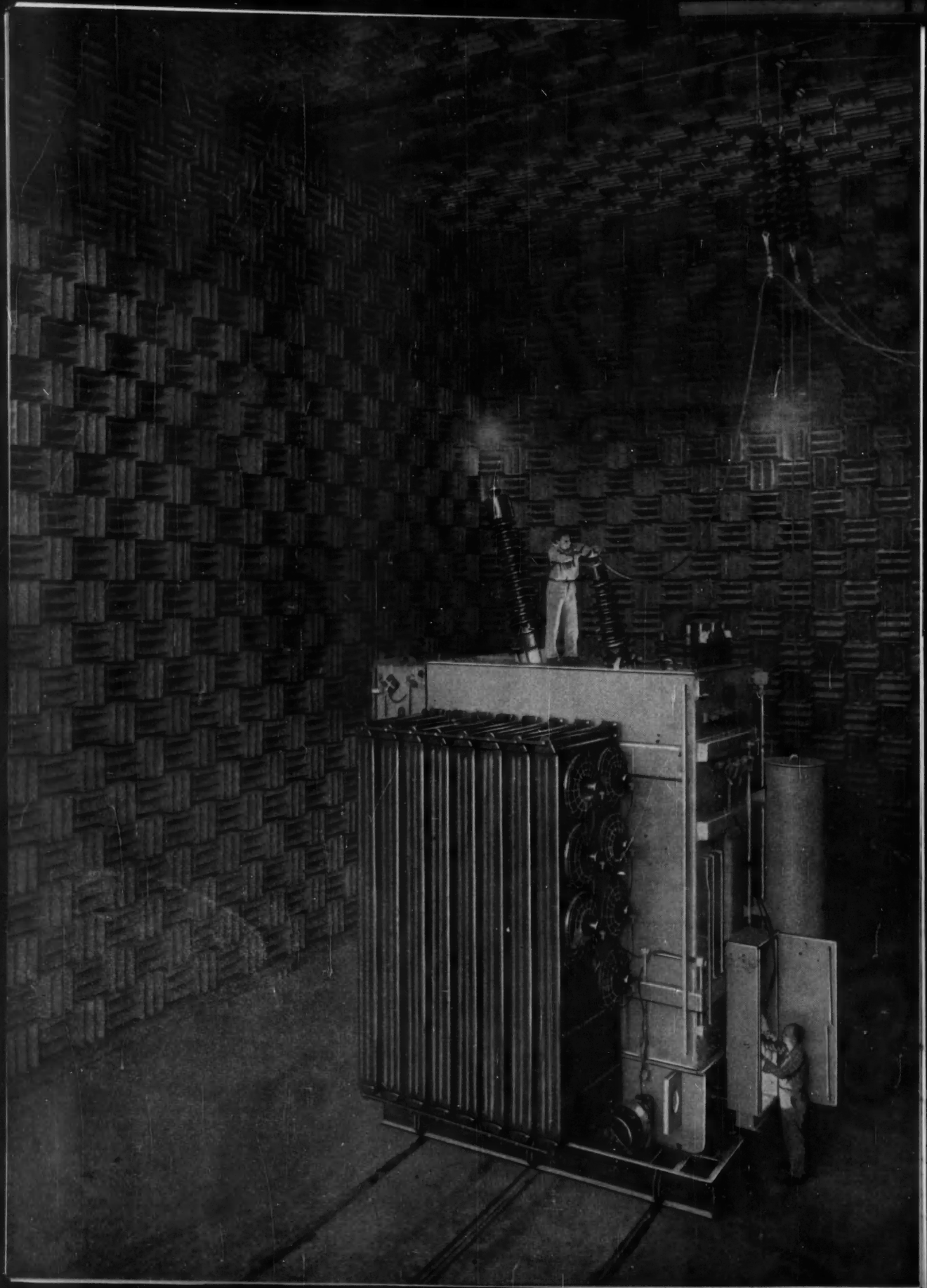
same ratings . . . to help you meet

the squeeze on available space

New Westinghouse SVS self-supporting lightning arresters are little more than half former height — with the same ratings. It's a matter of paralleling elements physically, but in series electrically, in the same housing. Case in point: The 182-kv rating is reduced from 230 inches to 126 inches in height — 18 inches in diameter. 25,000 foot-pound cantilever rating. No supporting structure is needed. Time takes a licking, too, with consequent ease of installation. SVS arresters in the new "pre-shrunk" style are available in all ratings, with the same time-proven quality and modern characteristics of all Westinghouse arresters. Get all the facts from your Westinghouse sales engineer — or write to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-60892

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***



Helping the industry meet its growing loads

NEW TEST CENTER . . . Giant stride in design of EHV transformers*

In the next ten years, more power producing and transmission capacity will be installed than now serves the entire nation. This expansion obviously will accelerate the trend to higher voltages and higher capacity equipment.

On November 8, 1956, Westinghouse put to work the largest and most completely equipped facility ever built, solely dedicated to power transformer design. It is the new research and commercial testing laboratory at Sharon, Pa. This ultramodern facility adds new vitality to Westinghouse leadership in helping the electric utility industry.

What are the problems that will be solved? More capacity in single units is one. Further reduction of vibration and noise in transformers is another. This laboratory will enable our engineers to verify and place in production transformers with tested, wholly new insulation systems—transformers constructed of materials with new endurance limits.

The results of this intensive investigation? Revolutionary new bench marks of transformer performance. Transformers that are quieter, more capable than ever before. Transformers that are more efficient and reliable. Transformers that are lighter, more compact per cubic inch of capacity. Transformers that are capable of doing the prodigious tasks equipment of the future is expected to do.

This new transformer laboratory is one more assurance that products Westinghouse brings to market will help electric utilities provide low-cost power, serve customers better, meet growing loads.

J-97198

*Extra High Voltage.

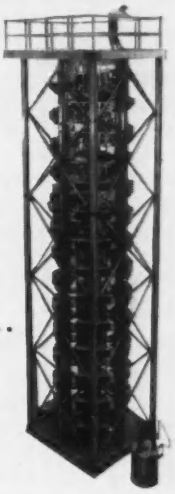
WATCH WESTINGHOUSE!

*WHERE **BIG THINGS** ARE HAPPENING IN **RESEARCH**!*

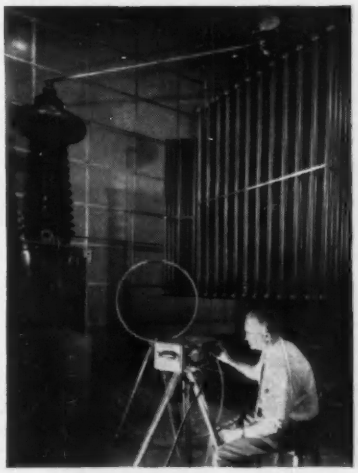
Transformers of the future have an appointment here . . .

The world's largest and most efficient facility of its kind, this anechoic vault can make complete sound measurements on transformers rated to and above 5,000,000 kva. Here is more proof from Westinghouse that transformers of the future will be smaller and lighter per kva . . . and quieter.

5,200,000-VOLT SKYSCRAPER . . .



This specially designed surge voltage generator is an important and unique tool in the verification and testing of new insulation systems at Westinghouse. This unit is comprised of one hundred and four 100-kv capacitors arranged in layers to a height of 52 feet.



EHV AND CORONA-FREE . . .

Analyzing and developing new and better insulation structures for higher voltage transformers is the primary task of this new radio influence testing room. In testing completed designs, as above, engineers measure R. I. voltages picked up by the loop antenna. Transformers being verified are energized by the 250-kv insulation-testing transformer at the left.

New knowledge pouring from this huge, new Westinghouse transformer research and test center can be measured in voltage added, tons of weight eliminated, greater capacity gained, and in better transformer investments.

Utilities Disclose Cable Problems

(*Continued from page* 31)

Cooperation between air-conditioner manufacturers and utilities was urged by P. W. Wyckoff, Chrysler Airtemp Division. Manufacturers should encourage local sales organizations to notify utilities of every installation in advance and develop adequate service, advise of electrical characteristics of their units, investigate sequential starting of their blower motors to cut in-rush, and design for four or less starts per hour.

See Cause for Concern

Utilities should set up reasonable starting current rules, cease asking for step starters, and bring flicker data up to date, he said. EEI's 1948 starting-current rules for single-phase motors do not apply to motors of types used in air-conditioning units, and the 1955 rules for 3-phase motors would force every major air-conditioner manufacturer to add step starters. But Wyckoff conceded utilities have cause for concern about the air-conditioning industry's aim to boost saturation to 25%.

Supplied from Capacitors

Motor magnetizing and other reactive loads on the Ohio Edison system are supplied from capacitors, said E. A. Rothfus. Locating these capacitors near the loads cuts losses, improves voltage, and releases capacity to carry kw load. Preferred location is at substation buses where 335,000 kvar of switched installations are in service and additions average 50,000 kvar per year. Size is usually selected to maintain voltage during line-out periods. Capacitors on distribution circuits are all unswitched primary units to a total of about 110,000 kvar and growing 5-10,000 kvar per year.

Urges Grounding Tanks

Discussion revealed that other companies favor distribution capacitors. One member reported use of 156,000 kvar of switched units, predominantly controlled by time clocks, and only 80,000 kvar unswitched.

Tanks of transformers bolted to poles or mounted on "T" hangers should be grounded for safety of linemen, suggested H. E. Ziegenfuss, Baltimore G&E Co. He reached this conclusion after tests showed that wood poles, far from providing insulation to protect linemen, would pass current varying with the moisture content of the wood but sometimes of dangerous magnitude. Grounding the tanks makes them a known condition for which proper covering provides protection and guards against tanks becoming energized by accidental contact with primary or secondary wires.

Wood Poles Discussed

More light was cast on the conductivity of wood poles by C. W. Leach, U. S. Steel Corp, and F. A. Ashbaugh, West Penn Power Co. Their investigations confirmed that the resistance varies inversely with moisture content. Creosote proved to have little effect on resistivity of the pole except as it retards movement of water and absorption from the surrounding atmosphere.

Investigation of 80 fatal accidents revealed 64 involving unsafe acts, 52 where rules were ignored, and none attributed to faulty equipment, reported S. H. Young, Hartford Electric Light Co. Noting that 60% of the victims had 2 to 10 years of experience, he urged that older men set an example in safety. And F. W. Jones, Gulf States Utilities Co, credited careful job planning, skilled workmen, well-maintained equipment, and safety devices for his company's 2-million-manhour safety record.
add it if operating record is not satisfactory, he added in discussion.

Interruptions Minimized

Shield wires on 46-kv lines of the Consumers Power Co system have cut lightning interruptions to a practical minimum, said Brent Ottinger. Records show an outage rate a tenth that for unshielded lines. The design, requiring two crossarms instead of one and using the pole top to support the shield wire, costs 21% more than unshielded lines but offers compensating advantages.

Research on aluminum conductors indicates that 1,100 microhm is significant in predicting the life of a joint, reported R. N. Coe, Southern California Edison Co. Objective now is to set up a standard test. And Horace MacVaugh said that cross sections will be proposed for five additional aluminum connectors following successful tests on the 4/0 size.

Reports on Task Force

Efforts of the Task Force on Mutual Assistance Coordination between utilities, reported its chairman D. F. Tulloch, have brought results in two areas. These are:

1. A roster of persons to call for aid on generation, overhead lines and underground plant in 46 companies.

2. A plan of communication channels for relaying storm information in three major areas, viz: Northwest, North and South Central, East Central and Northeast.

PEA Prime Mover

(*Continued from page* 32)

treatment used to prevent trouble in the demineralizer beds and that disposal of waste chemicals is sometimes a problem.

Simple, preventive practices assure trouble-free boiler operation, said R. C. Ulmer, Combustion Engineering, Inc. He cited the results of an investigation which his company and Philadelphia Electric are continuing, using a 5,000-psi, 1,200F test boiler. He said that three Combustion Engineering supercritical-pressure units under construction will use feedwater within these limits:

Total solids	0.25 ppm
	(0.5 ppm for short periods)
pH	9.0 to 9.5
	(by N_2H_4 and NH_3)
Total iron	0.01 ppm
Total copper	0.01 ppm
Silica	0.02 ppm
Dissolved oxygen	0.007 ppm

CAF Seen to Lead Africa in Electrical Engineering

"There is no reason why the Central African Federation should not become the leading country in Africa in electrical engineering," asserts Sir Malcolm Barrow, Federal Minister of Power. "Already, even without the giant Kariba Hydro-Electric scheme under construction on Zambesi River," he said, "there can be few countries more richly served per head of population than Southern Rhodesia and there are few countries where electricity costs as little as it does here."

Since 1936, first year of operation, Electricity Supply Commission's sales rose from 10-million units to 600 million last year.

SANGAMO AUTO VAR CAPACITOR EQUIPMENT

low cost ...light weight ...quick and easy to install

Twelve-unit multi-row Auto Var Capacitor Equipment for crossarm mounting. Assembly is light in weight—easy to install on crossarm.

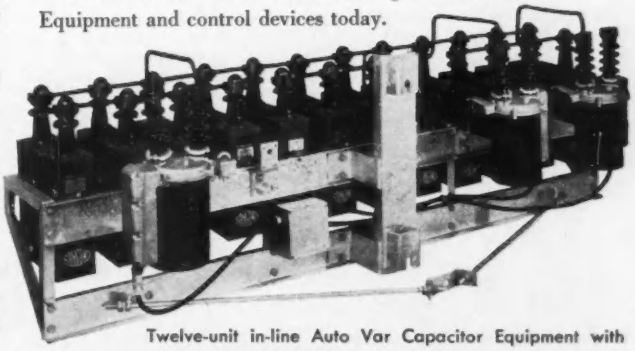
Sangamo Auto Var Equipment is completely assembled for automatic operation. It is wired at the factory. It enables capacitor installation on distribution circuits in amounts approximating peak load kilovars where permanent connection of such capacitors would be disadvantageous at light loads.

Both multi-row design for crossarm mounting, and in-line design for direct-to-pole mounting, are available. Equipment includes hot galvanized steel rack, capacitor units, electrically operated oil switches, junction box and all wiring. Switches can be omitted if desired.

Auto Var Equipment can be supplied in all distribution voltage ratings and with standard Kvar ratings ranging from 225 to 600 Kvar. Choice of either 25 Kvar or 50 Kvar individual capacitors.

Buy Sangamo Time Switches and Lincolntrols for automatic control of Auto Var Equipment as a function of time, volts, amperes, watts or vars.

Write for full information on Sangamo Auto Var Equipment and control devices today.



Twelve-unit in-line Auto Var Capacitor Equipment with electrically operated oil switches. Close coupling to pole gives low bending moment.

SANGAMO Electric Company

SPRINGFIELD, ILLINOIS

PC56-4

Duke Power Co Advances Miller, McGuire

O. J. MILLER

W. B. McGUIRE

Duke Power Co has announced the recent appointment of O. J. Miller as executive vice president. Miller, a vice president and general manager since 1948 and a director of the company since 1946, will be in charge of all operations in his new capacity.

Having been in the utilities business since 1916, he was manager of production and transmission for Tennessee Electric & Power Co; joined the Commonwealth & Southern Corp in 1940 and then finally Duke Power Co in 1943. An Ohio State University graduate, Miller is an electrical engineer of long standing.

Also promoted at Duke Power Co was W. B. McGuire, new assistant to the president. Formerly assistant general counsel in the legal department, McGuire has been a director since 1954 and is a past president of the Mecklenburg County bar association at Charlotte, N. C. Mr. McGuire is graduate of Davidson College and the Duke University Law school.

NEES Promotes Wheeler to VP

New England Electric System has announced the appointment of Leeds A. Wheeler as vice president and general counsel of the system.

A graduate of Harvard College and Harvard Law School, Wheeler has been associated with the system since 1934. He first came to the system as attorney for the New England Power Engineering & Service Corp, and in 1941 was elected vice president of the New England Power Service Corp. He was named general counsel for New England Electric System in 1948.

In addition, Donald G. Allen has been named assistant general counsel and Richard B. Dunn has been designated corporation counsel.

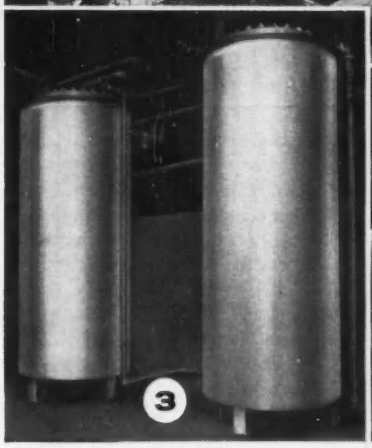
LEEDS A. WHEELER

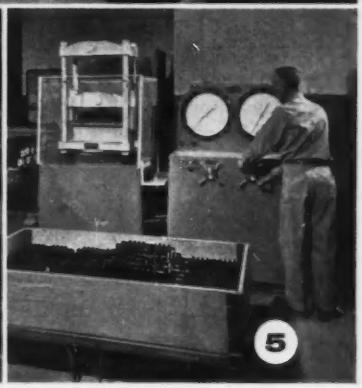
Leach Heads Jasper Blackburn

The board of directors of Jasper Blackburn Corp of St. Louis have announced the election of Raymond N. Leach as new president of the company. Leach, who previously served as executive vice president of the firm, now fills the post formerly held by Mrs. Francis B. Weaver.

Leach has been associated with Jasper Blackburn since 1932. After serving in various capacities, he was appointed to the position of sales manager of the company in 1936 and three years later was elected to a vice presidential post. He has served in his most recent capacity of executive vice president for the past three years.

RAYMOND N. LEACH

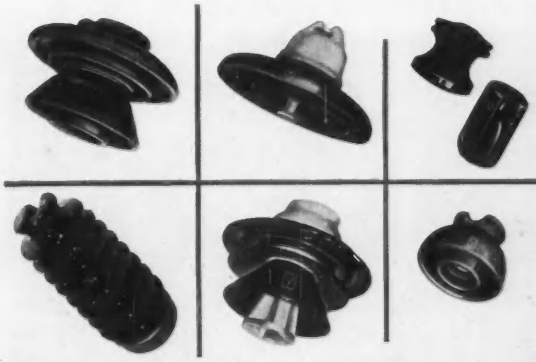




5 BIG REASONS WHY...

VICTOR GIVES YOU BETTER INSULATORS

1. Demand for VICTOR Insulators has necessitated a continual plant expansion running into many millions of dollars. In the last seven years alone, our plant area has been increased 20% to provide greater space for manufacturing, storage and research!
2. This impulse generator in VICTOR'S electrical laboratory, enables our engineers to perform steep front wave tests as well as standard impulse tests.
3. All processing water used by VICTOR is demineralized. VICTOR was the *first* in the industry to install water demineralizing equipment. A patent on our process is now pending.
4. To certify insulator soundness, VICTOR uses black light. Unfired insulators are sprayed with fluorescent material, then subjected to a near ultra-violet light source.
5. This hydraulic testing machine in VICTOR'S specialty porcelain department gives open cutouts and similar insulators a routine calculated transverse load before electrical test.



"BETTER INSULATORS THROUGH RESEARCH"

SPECIFY VICTOR

Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

American Brass Ups Rockwell to VP

ALLEN W. ROCKWELL

American Brass Company, a 100%-owned subsidiary of Anaconda Company, has announced the promotion of Allen W. Rockwell as vice president of the Waterbury Division. Rockwell, who joined American Brass in 1935 in the east tube mill, successively served in the division's personnel and employment office, was soon made labor supervisor and became division works manager in 1946.

Promoted to Division Manager in 1953, Rockwell remained at that post until his present appointment.

Mr. Rockwell succeeds Ralph T. Benedict who is retiring after 52 years service with the company.

PERSONAL BRIEFS

San Diego Gas & Electric Co has appointed **Lester L. Wright** manager of the National City district, succeeding **Lemoyne Lambert** who becomes La Jolla district manager. Lambert replaces **P. H. Adams** who is transferring to Orange County district as manager, to take over **Kenneth M. Brown's** former post. Brown is transferring to the Chula Vista district as manager.

Carolina Power & Light Co's Raleigh District has named **Frank H. Pruette** assistant manager to succeed **Leslie A. Pearce,** who has been transferred to Sanford, N. C.

D. A. Campbell is new superintendent of operations for Pennsylvania Power & Light Co at Hazleton.

In addition to his present duties as vice president of Public Service Co of Oklahoma, **Wright Canfield** has been named coordinator for the Tulsa Division with added responsibility for system-wide economic planning.

Charles S. Hill has been designated manager of Florida Power & Light Co's Arcadia district, succeeding **Keith Robertson,** retired.

Washington Water Power Co has announced the promotion of **C. N. Adams** as Spokane Division manager.

New executive secretary of Wisconsin Utilities Association is **Dale F. Hansman,** who assumes this post with the retirement of **Arthur F. Herwig** in May 1957.

Philco Corp has promoted **William J. Horn** to advertising manager of it's Appliance Division.

Henry F. Argento has been appointed vice president of commercial sales for Raytheon Manufacturing Co.

Allis-Chalmers Manufacturing Co has announced two appointments in its tractor group: **W. J. Klein** vice president and director of sales; and **W. L. Voegeli** general sales manager.

General Electric Co's specialty transformer department has elevated **Ray H. Rogers** to sales manager for industrial components, and **Harold W. Fisher** to manager of sales to distributors, contractors and users . . . Product Service Section of GE's small steam turbine department has named **William E. Wallace** supervisor of Navy and Marine installation and **George Dale** specialist of industrial and utility service, with **Howard M. Perry** as manager of sales for the department . . . **Henry V. Erben,** 35-year veteran of GE, is retiring due to health reasons, but will remain as consultant to the executive group.

OBITUARY

Henry C. Rice, 67, retired sales manager for Southern California Edison Co, died in Los Angeles.

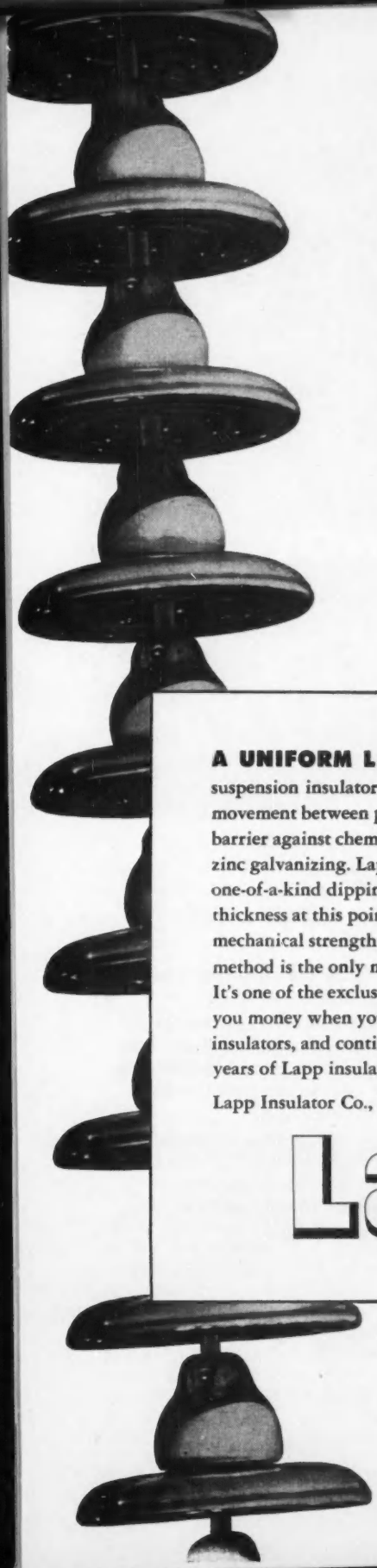
Paul B. Juhnke, 77, retired chief operating engineer for Commonwealth Edison Co, died recently in Chicago.

Joseph S. Thompson Feted

On the right, Norman R. Sutherland, president of Pacific Gas & Electric Co, congratulates Joseph S. Thompson on his 50th year as president of Federal Pacific Electric Co. FPE's Louis W. Cole, chairman of the board, is seated between them.

Thompson, together with several friends in 1906, set up Pacific Electric & Manufacturing Co to build high-voltage switches.

In 1947 National Electrical Manufacturers presented Thompson with a complimentary scroll for his outstanding success in the electrical industry and he also enjoys a fellowship with American Institute of Electrical Engineers.

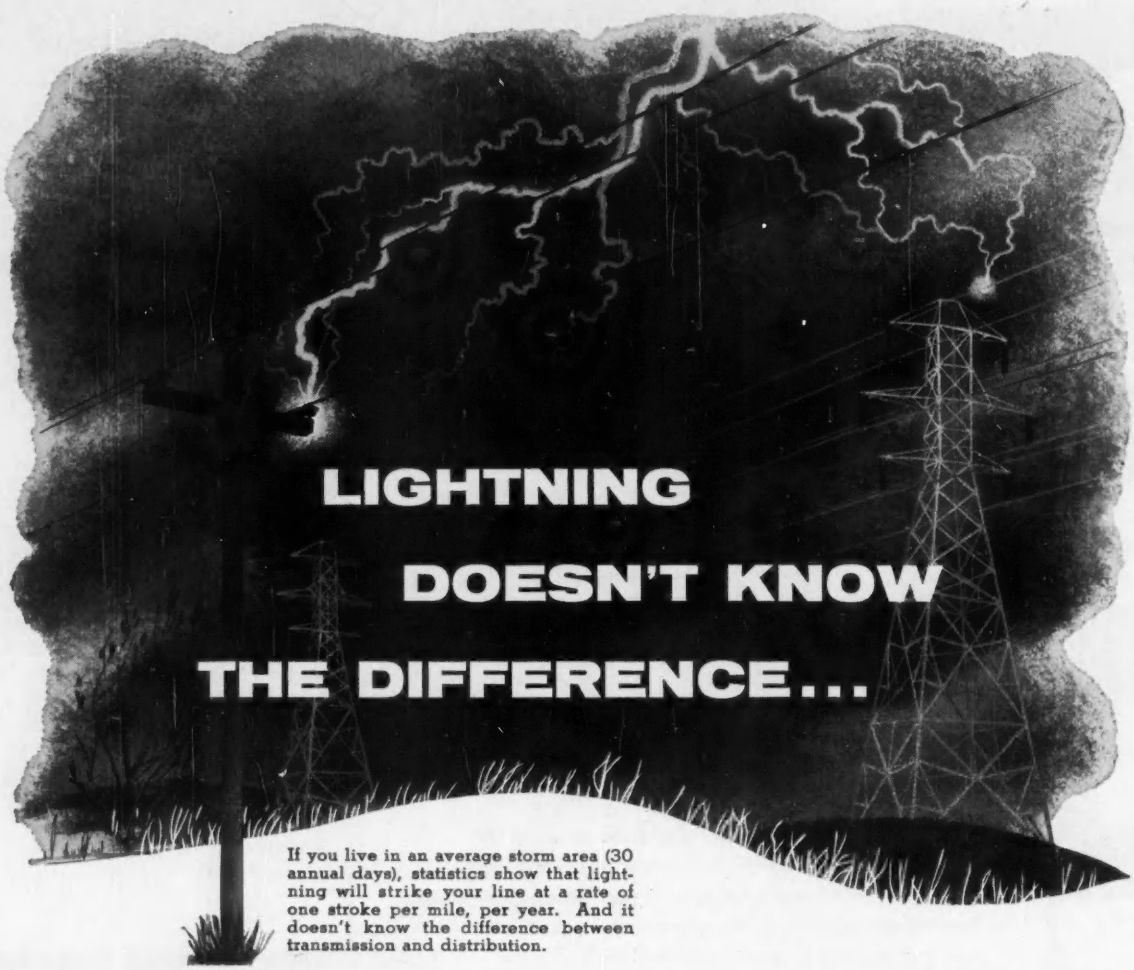


MOST FOR YOUR MONEY in high voltage insulation. Today's Lapp suspension discs are the best insulators of this design we have ever made. Their quality—and their low price—are the result of automation and control in manufacture. Their uniformity is your guarantee of their performance—in mechanical strength, electrical permanence, long life.

A UNIFORM LAYER of resilient paint on the suspension insulator pin provides a cushion for thermal movement between pin and cement porcelain head—and a barrier against chemical action between cement and zinc galvanizing. Lapp designed and built this one-of-a-kind dipping machine because paint thickness at this point is a critical factor in insulator mechanical strength, and because such an automatic method is the only means for assuring its uniformity. It's one of the exclusive Lapp techniques that save you money when you buy Lapp suspension insulators, and continue to pay off over long years of Lapp insulator service.

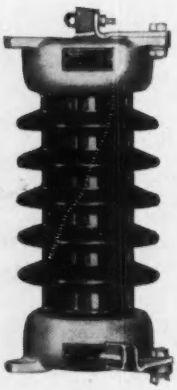
Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp



LIGHTNING DOESN'T KNOW THE DIFFERENCE...

If you live in an average storm area (30 annual days), statistics show that lightning will strike your line at a rate of one stroke per mile, per year. And it doesn't know the difference between transmission and distribution.



Has High Cost Kept Arrester Protection Off Your Primary Distribution?
Then Investigate The Thorex

To lightning, all lines look alike. But some are better protected than others. High voltage transmission has good shielding, efficient grounding, and the best arresters at stations. Primary distribution, in the range of 22 kv and below, seldom enjoys such privileges, however. Yet these are the pipelines to your customers.

Once, it was not economic to equip such lines with arrester protection--it was either too costly or ineffective. Today it's different. Today, a lightning arrester at "rock-bottom" price, the Thorex GP, passes every standard requirement for first class station application, and is materially better than any arrester on the market just a few years ago.

Now, you *can* install arresters on the lines that actually deliver your power. See how inexpensive it is with the Thorex--inexpensive, but the best you can get!

Ohio Brass

MANSFIELD OHIO, U.S.A.

4635-16.

MEETINGS CALENDAR

NOVEMBER

American Society of Refrigerating Engineers—43rd Semi-Annual Meeting, Hotel Statler, Boston Mass., Nov. 25-28.

American Society of Mechanical Engineers—Annual Meeting, Statler & Sheraton-McAlpin Hotels, New York City, Nov. 25-30; 22nd National Exposition of Power and Mechanical Engineering, Coliseum, New York, N. Y., Nov. 26-30.

Edison Electric Institute—EEI-AGA General Accounting Committees, Henry Grady Hotel, Atlanta, Ga., Nov. 26-27; Accident Prevention Committee, Statler Hotel, Hartford, Conn., Nov. 26-28.

Inland Empire Waterways—23rd Annual Convention, Chinook Hotel, Yakima, Washington, Nov. 26-27.

Third International Automation Exposition—New York Trade Show Bldg., N. Y., Nov. 26-30.

Great Lakes Conferences of Railroad and Utilities Commissioners—First Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va., Nov. 29-30.

DECEMBER

Electrical World—Electrical Space Heating and Heat Pump Conference, Barbizon-Plaza Hotel, New York City, Dec. 5-6.

Institute of Radio Engineers—2nd Instrumentation Conference, Biltmore Hotel, Atlanta, Ga., Dec. 5-7.

Edison Electric Institute—1957 Conference Planning Committee, sponsored jointly with American Gas Association, EEI-AGA Headquarters, New York, Dec. 6-7; Street Lighting Committee, Dayton, Ohio, Dec. 6-7; Commercial Cooking & Water Heating Committee, Cleveland, Ohio, Dec. 13-14.

JANUARY, 1957

Northeastern Weed Control Conference — Sheraton-McAlpin Hotel, New York City, Jan. 10-12.

Doble Engineering Co—24th Annual Conference of Doble Clients, Sheraton-Plaza Hotel, Boston, January 14-18.

Southeastern Electric Exchange—Personal Administration Section Meeting, held jointly with EEI, Sheraton-Park Hotel, Washington, D. C., Jan. 17-19.

American Institute of Electrical Engineers—Winter General Meeting, Hotel Statler, New York, Jan. 21-25.

• **American Welding Society**—Illinois Institute of Technology—3rd Annual Midwest Welding Conference, Illinois Tech Chemistry Bldg., Chicago, Ill., Jan. 30-31.

Missouri Valley Electric Association—Industrial & Commercial Sales Conference, Hotel President, Kansas City, Mo., Jan. 31-Feb. 1.

FEBRUARY

National Association of Purchasing Agents—26th Annual Mid-Winter Conference, Public Utility Buyers' Group, Brown Hotel, Louisville, Ky., February 3-5.

National Electrical Week—Second Annual Observance, Feb. 10-16.

Electric Institute of Washington—Electrical Trade Conference & Exposition, Shoreham Hotel, Washington, D. C., February 12-14.

American Institute of Electrical Engineers—1957 Transistor & Solid State Circuits Conference, sponsored jointly with Institute of Radio Engineers and University of Pennsylvania, University of Pennsylvania, Philadelphia, Pa., Feb. 14-15.

• **13th Annual National Adequate Wiring Conference**—Sherman Hotel, Chicago, Ill., Feb. 21-22.

American Society of Heating and Air-Conditioning Engineers—63rd Annual Meeting, Chicago, Ill., Feb. 25-28.

Pacific Coast Electrical Association—Business Development Section, Sheraton-Palace Hotel, San Francisco, Feb. 28-Mar. 1.

MARCH

• **Southern Safety Conference**—John Marshall Hotel, Richmond, Va., Mar. 3-5.

• **Louisiana State University**—Annual Conference on High-Speed Computers, Baton Rouge, La., Mar. 5-8.

• **Pacific Coast Electrical Association**—Engineering & Operating Section, Hotel Statler, Los Angeles, Mar. 21-22.

• **Oklahoma Utilities Association**—Biltmore Hotel, Oklahoma City, Okla., Mar. 27-28.

• **Illinois Institute of Technology**—19th Annual American Power Conference, Hotel Sherman, Chicago, Ill., Mar. 27-29.

• Additions this week

400% Energy Rise Seen by B. C. Utility

A 400% rise in British Columbia Power Commission's energy within the next 10 years has been predicted by Lee Briggs, commission general manager.

He said that the government-owned utility, which now generates 1 billion kw per year, must develop a large amount of low-cost power within the foreseeable future if it is to fulfill its proper function in the province's economy. The equivalent in installed capacity, he said, should be between 1.3-million hp and 1.5-million hp as compared with current capacity of 300,000 hp.

Progress last year, he stated, included building of 480 mi. of distribution circuits where the average density is only 16 customers per mile. This was contrasted with the 75 to 250 customers per mi. achieved in larger cities.

He emphasized that extension of rural electrification in B.C. presents special problems in cost. "Nevertheless, in just such places the advantages of electric service are more obvious, more appreciated, and the plans our rural people make for their own future, and that of their children, are partly contingent upon the supply of electricity or the lack of it."

During the past five years, he said, the over-all average number of customers per mi. in Commission operations has dropped from 18.5 to 16.2 as a result of electrical extensions into more thinly populated areas.

Now Balanced Design in Allis-Chalmers

Engineered
to provide all the advantages you want and need

In the *balanced design* of Allis-Chalmers power transformers, each feature complements the others to provide outstanding dependability and long transformer life.

High Impulse Strength — Coil assemblies are designed to withstand repeated lightning and switching voltage surges without damage to the transformer.

Corona-Free Design — Keeps transformers young. Full insulation strength is maintained because transformer parts are kept free of corona's injurious effects.

Quiet Operation — Constant research in transformer noise has led to reduced sound levels in Allis-Chalmers transformers.

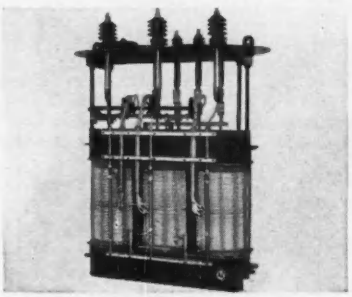
Reduced Size and Weight — Substantial reductions in height and weight simplify installation and relocation. Larger units can be shipped completely assembled.

High Short-Circuit Strength — In Allis-Chalmers transformers, circular coils are preshrunk and rigidly braced to withstand short-circuit conditions. Careful electrical balance of windings minimizes mechanical forces.

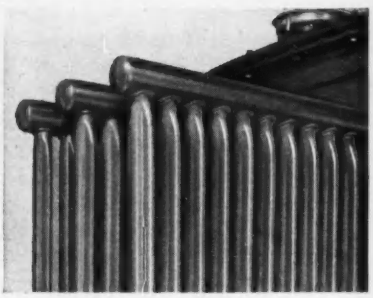
Get the complete "balanced design" story from your Allis-Chalmers representative. With a vast background of application engineering experience at his disposal, he will be glad to discuss transformer problems with you. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Mechanical Strength...

One of the Many "Engineered-Together" Features of A-C Small and Medium Power Transformers



Side frame design locks core and coil assembly firmly to protect against short-circuit forces. Machine-wound insulating tubes provide rigid support for leads.

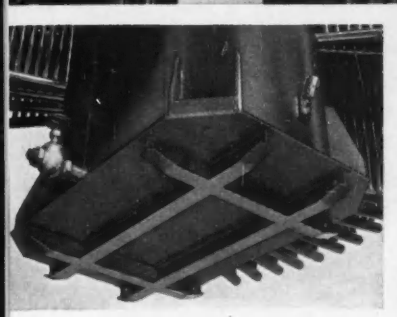


Radiator assembly is welded into tank wall to provide neat appearance and strong construction. Gasket maintenance is eliminated.

LIVE BETTER ELECTRICALLY

ALLIS-

Power Transformers



New base combines strength with utility. Heavy I-beam supports are turned upward at ends to allow sliding or rolling of transformer in any direction.

CHALMERS

A-C
ALLIS-CHALMERS

A-5149

Relay Care Avoids False Operation

H. C. BARNES, Relay & Protection Engineering Head, American Gas & Electric Service Corp, New York, N. Y.

Improper connection of voltage and directional control for overcurrent relays is occasionally the cause of false service interruptions.

Voltage control is often used where the load demands setting phase overcurrent relays higher than considered safe for short circuits. To assure positive overcurrent relay action, American Gas & Electric Service Corp's policy calls for a setting not exceeding one-third of the short-circuit current available for a fault at the remote end of the line, the system being at full capacity.

This 3-to-1 margin is necessary because of possibly reduced short-circuit current resulting from generating units or lines out of service, resistance in the fault, or other causes. To assure that the line doesn't trip for load swings, the relay setting is generally kept at at least twice the expected load. As these requirements are in opposition, a condition often arises which cannot be covered without voltage control.

There is no need for voltage control of the ground relays as they are independent of load currents on transmission circuits.

Voltage control is an arrangement in which overcurrent relays are made inoperative unless there is a fault on the system, as indicated by a voltage dip. In Fig 1 the contacts of an auxiliary relay, 27X, are connected to short the coils of the overcurrent relays, 51. When voltage dips on any phase, one or more voltage relays, 27, drop out and energize the auxiliary relays, 27X, whose contacts then open to remove the shorting of the overcurrent relays, 51, so that they can function to clear the fault.

Thus, being shorted under normal system voltage conditions, the relays are insensitive to load current and low settings can be used on them to assure clearing of faults at the remote end of the line.

This scheme is also sometimes used to overcome false tripping caused by "back-lash" or contact bounce of di-

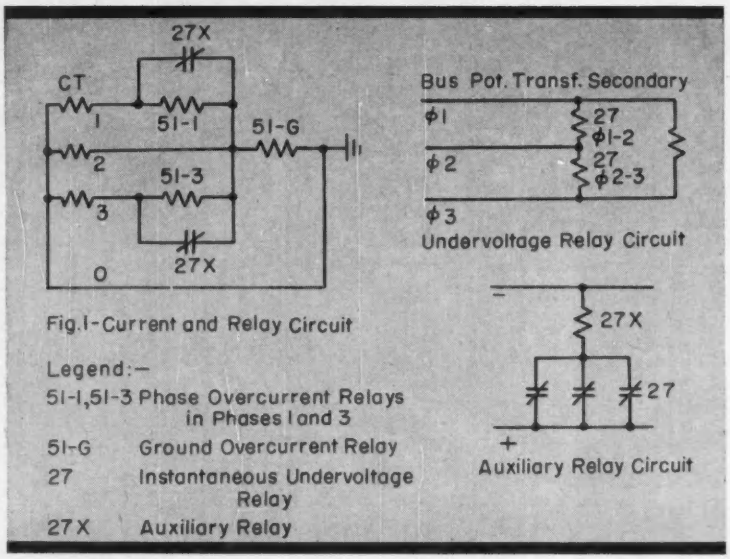


Fig. 1 - Current and Relay Circuit

Legend:—

51-1, 51-3	Phase Overcurrent Relays in Phases 1 and 3
51-G	Ground Overcurrent Relay
27	Instantaneous Undervoltage Relay
27X	Auxiliary Relay

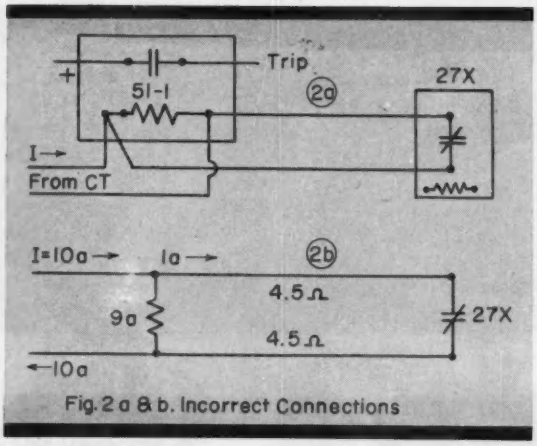


Fig. 2 a & b. Incorrect Connections

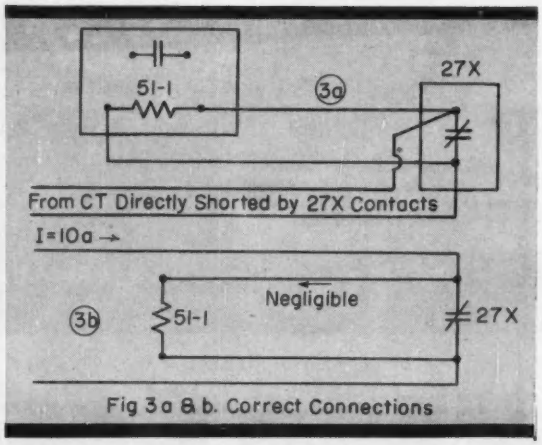


Fig 3 a & b. Correct Connections

ADVERTISEMENT

Living the good life—

up on a utility pole

WE'D LIKE to alter that headline just a little. It should read: Living the good *long* life – up on a utility pole . . . since that's the aim of our product.

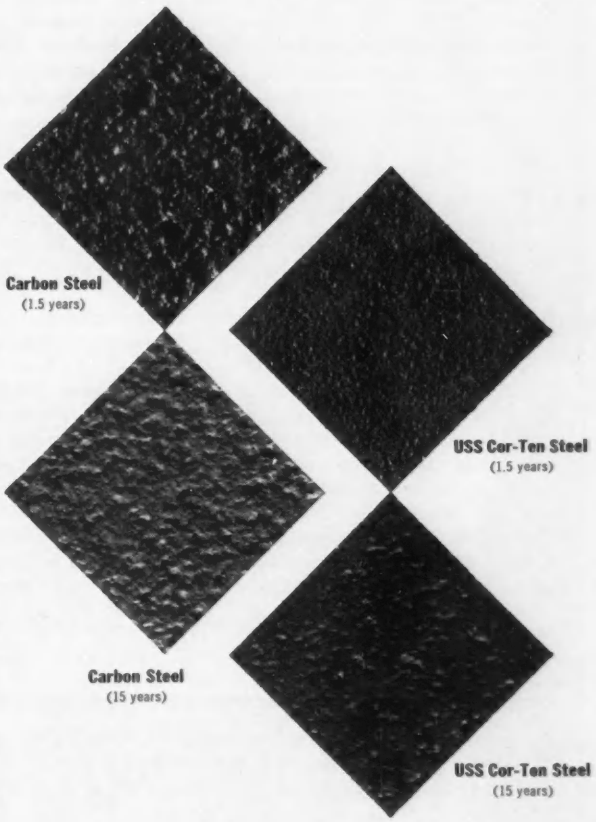
Engineers, design specialists and corrosion experts have devoted countless hours—and dollars—to the development of pole line hardware capable of matching the life of a treated pole. The nudge of necessity in this search being the ever-increasing costs of replacing hardware.

Twenty-three years ago, United States Steel first marketed a high-strength, low-alloy steel under the trade name of USS COR-TEN. It was developed specifically for applications requiring greater resistance to atmospheric corrosion and a higher yield point than was offered by regular carbon steel. Today, nearly 2,000,000 tons of USS COR-TEN Steel are out-performing carbon steel on hundreds of jobs all over the world. In short, the product has been proven. More and more cost-conscious utility companies are specifying that their pole line hardware be made from USS COR-TEN High Strength Steel.

Speaking of proof, let's look at two samples . . . one of carbon steel, the other of USS COR-TEN Steel, both uncoated. The samples were photographed after a year-and-a-half exposure in industrial atmosphere. Notice how much coarser the oxide film is on the carbon steel. This allows absorption of corrosion-inducing moisture. The sample of USS COR-TEN Steel has a far smoother, more tightly adhering film of oxide. This tight film acts as a barrier, holding moisture *away* from the steel, permitting it to evaporate—thus retarding corrosion.

Whoooosh! Fifteen years whiz by and our samples are still sitting it out in the same atmosphere. Again the camera shutter is flipped. Now we find the carbon steel well along in its tendency to revert to its original state, ferric oxide. The loss of weight by actual measurement is *over four times* that of the USS COR-TEN Steel sample. Probably a more graphic way to describe this test would be to say that if these two samples—in the form of hardware—had been on your utility poles, you would be replacing the carbon steel lot while the USS COR-TEN Steel hardware would be quite obviously fit for many more years of service.

Pole line hardware made of USS COR-TEN High Strength Steel is on the market now. If you would like more information about high-strength, corrosion-resistant hardware, or would like the names of companies manufacturing it, write to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION,
WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

rectional relays occasioned by the sudden release of torque when a fault external to the relay's line section is cleared by other breakers. Directional relay contacts are then substituted for the voltage relay contacts.

Fig 1 looks straightforward enough. Actually, it is misleading inasmuch as it neglects the resistance of the wiring leads. It represents a type of malpractice which occurs occasionally even though it has been recognized for years. Its recurrence arises from the difficulty of transmitting to new personnel all that has been learned through experience and analysis.

Resistance Critical

Fig 2a shows the improper connection (only one relay being shown for simplicity). Fig 2b is an exaggerated example. It assumes a 5-amp relay pickup, 4.5 ohms resistance per lead between the overcurrent relay coil, 51-1, and the shorting contacts, 27X, a 1-ohm resistance, and 10 amp flowing in the current transformer circuit. The current splits in inverse proportion to resistances through the overcurrent relay coil and the contact circuit. Consequently 9/10 x 10 or 9 amp flow in the overcurrent relay coil and cause false tripping.

The solution in this case is re-routing the leads from the current transformer as shown in Fig 3a and 3b so that they go directly to the shorting relay contacts, 27X, rather than to the overcurrent relay coil, 51-1. With a zero contact resistance, all current then flows through the contacts, none through the coil. In actual practice contact resistance is nearly zero as the relays are especially selected for the purpose.

Tests were made using only 6 ft of No. 12 switchboard wire (approximately 0.01 ohm per lead) between 27X and 51-1. With 9.1 amp total current, only 0.37 amp went through the overcurrent relays. With 20 amp, only 0.5 amp went to the overcurrent relays.

Even in checking for this condition an inexperienced person can be misled. The usual tendency is to connect an ammeter in series with the overcurrent relay coil to determine the current therein. The difficulty with this procedure is that the resistance of the ammeter and its leads add to the coil resistance to force most of the current through the shorting contacts, giving a false indication of security.

The ammeter should be inserted in the shorting contact circuit and the current in the coil determined as the difference between this reading and the total current from the current transformer. This is pessimistic but safe. Otherwise the only safe course is to omit ammeters from both coil and contact circuits and force more current through the current transformer circuit than is ever expected to be encountered. When the relay contacts do not close, the arrangement is safe.

Directional relay application is even more critical than voltage control of overcurrent relays as the shorting must be effective with the high currents present during a fault. Voltage control of overcurrent only needs to handle load currents.

Another situation likely to cause difficulty with the voltage control scheme when it is not carefully checked is illustrated in Fig 4 which assumes an open or loose connection in the overcurrent relay coil, 51-1, at point X. As this relay is shorted by the auxiliary, 27X, ammeters on the board and test meters inserted in other relay circuits show normal readings, indicating a complete circuit. This makes inoperative not only the defective phase overcurrent relay but also phase instantaneous and carrier relays for phase 1-2 and all ground relaying for phase 1-to-ground faults.

Open Affects Relaying

Accordingly, as nothing remains to clear faults of this kind, serious damage and system instability can result. When a similar open exists on phase 3, all relaying is inoperative for any fault except a phase 2-to-ground fault. Therefore it is essential that tests be made with the shorting relay contacts open as well as closed.

System growth can also render voltage control of overcurrent relays inoperative. To assure proper operation for faults, the dropout setting of voltage relays must be higher than the voltage remaining during a fault. It must not be so high, however, that the relays drop out on low voltage during emergency loading or fail to reset after a fault has caused disconnection of a line, thereby lowering the voltage. The latter failure can result from the pickup being inherently 5 to 10% higher than the dropout.

A dropout setting of 90 v with a resultant pickup of 95 v is normally used. This condition assures operation

(*Continued on page* 51)

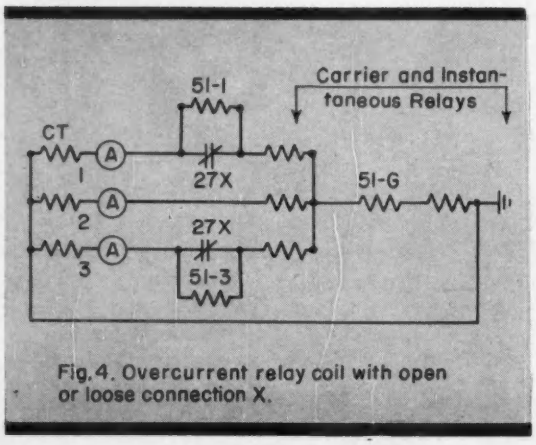


Fig. 4. Overcurrent relay coil with open or loose connection X.

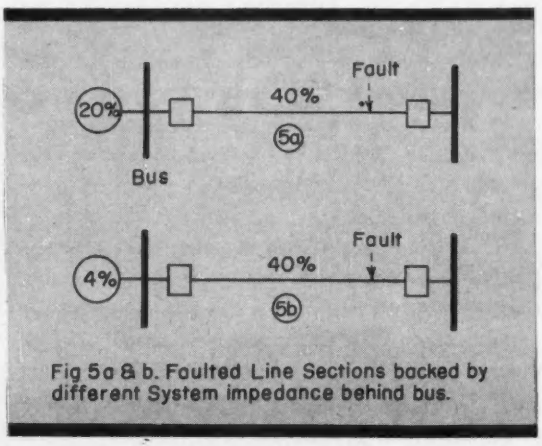


Fig 5a & b. Faulted Line Sections backed by different System impedance behind bus.

G&W Overhead Style—
AUTOMATIC TRANSFER OIL SWITCHES

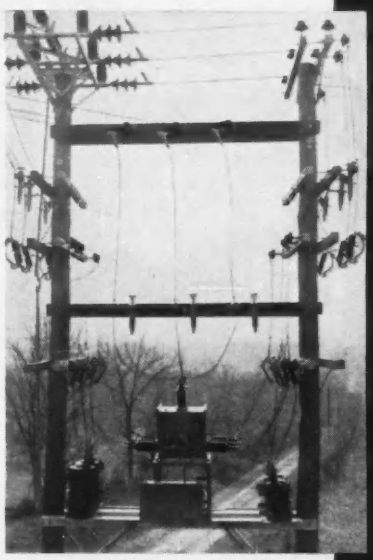
help provide service continuity by transferring important loads to an alternate feeder automatically.

G & W Type "RA" oil switches with Model "F" operating mechanisms are furnished as practical, economical and remarkably trouble-free units for pole top or overhead installations as well as for vault or underground locations.

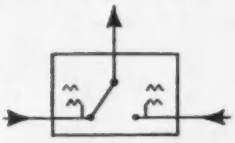
Oil switch and mechanism case of heavy welded steel construction, hermetically sealed. Units are available in double throw (as shown) or as two single throw oil switches in separate tanks. Switching contacts in oil are protected against corrosion. Rated 400 amperes full load break.

What the Model "F" Mechanism does—

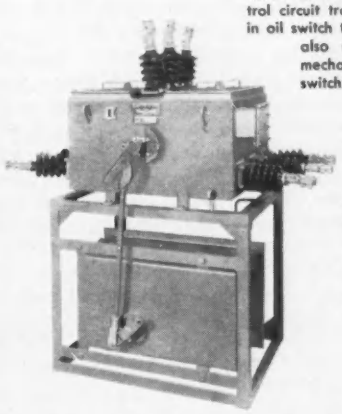
- When preferred feeder voltage fails, the load is automatically transferred to the emergency feeder.
- When preferred feeder voltage is restored (for a period of ¼ minute) the load is automatically returned to the preferred feeder.
- There is no "hunting" on system disturbances. Load cannot be thrown to a "dead" source.
- Model "F6" automatic mechanism provides for remote operator selection of either feeder as the "preferred."



Typical installation of a 15 Kv. unit. Standard pole top transformers supply 230 volt control circuit.



RATINGS—400 AMPERES.
5 Kv.—7.5 Kv.—15 Kv.—23 Kv.



15 Kv. double throw unit with control circuit transformers enclosed in oil switch tank. Overall space also saved by locating mechanism under the oil switch.

Simple and easy to install—

With control circuit wiring within the mechanism case completed at the factory, installation of the unit involves mounting the unit and making the load and two feeder connections.

Get in touch with us or our representatives for further data and prices on automatic transfer oil switches to meet your requirements.

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EXCLUSIVE NEWS:

WESTINGHOUSE METAL-CLAD SWITCHGEAR . . .

FIRST 75 MVA MAGNETIC AIR BREAKER—5-CYCLE INTERRUPTION

A jump ahead of demands on modern switchgear, Westinghouse announces an air circuit breaker rated at 75 MVA interrupting capacity. And more—5-cycle operation means fast arc extinction.

This new 50-DH-75 breaker offers:

1. The long-proved, exclusive Westinghouse De-ion® arc interrupter, the fastest, most efficient method of arc extinction ever devised.

2. Main contacts are self-aligning, multiple line, butt type.

3. New lightweight, hinged-type arc chute that has improved arc interruption. Inspection of contacts is now even simpler—remove just one bolt and tilt back arc chute.

Specify Westinghouse metal-clad switchgear—now even more versatile, faster, more dependable. Get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60888-X

John Kozlovic, Design Engineer, High-Voltage Air Circuit Breaker Engineering Section, discusses features of the first 75 MVA magnetic air breaker. New Westinghouse air breaker is rated 75 MVA at 4160 volts, 50 MVA at 2400 volts interrupting capacity; 1200 amperes continuous; 5-cycle interruption.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

CONFERENCE SPEAKERS included: Allen A. King, president, Northern States Power Co; Harold H. Young, Eastman Dillon, Union Securities & Co; and Donald S. Kennedy, president, Edison Electric Institute and Oklahoma Gas & Electric Co

Iowa Meeting Hears Kennedy

Give the people the facts, and the electric industry can expect a fair deal, Donald S. Kennedy, president of the Edison Electric Institute, told the Iowa Utilities Association at its ninth annual management conference, Oct. 15-16, at Des Moines. Kennedy, also president of Oklahoma Gas & Electric Co, urged the conference to work hard at telling the industry's story.

Public power advocates are mistaken when they proclaim that they are speaking for all the people, said Arthur Barnett, managing director, National Association of Electric Companies. Barnett told the conference that public power protaganists are fighting changes in the national power policy established in the 1930's but that the changes can't be put off much longer.

A major problem facing the industry in recent years is the narrow margin between Congressional partisans in the public power issue, said George A. Neal, president, Iowa Public Service Co. To gain more understanding of power policy, he said, pro-private power Congressmen must be in the ratio of 60 to 40%, instead of the present 52 to 48%.

Customers are generally sympathetic with power company policy when they understand the issues, said M. L. Kapp, president, Interstate Power Co. He said his observation was based on soundings taken in his company's service area.

In buying electricity, the consumer sometimes feels that he has no choice as to whom he buys from, said W. Howard Chase, president, Public Relations Society of America. Reporting on 2,000 "depth" interviews with customers, Chase said that the findings showed that some customers complained that a power company could withhold its service when the electric bill is not paid, that power companies merely convert a natural phenomenon to sell it, and that the customer is never finished paying for electricity. Customers, he said, do not realize the costs involved in power company operations.

More Profits Are Needed

Allen S. King, president, Northern States Power Co, charged that power companies are allowed only enough in their rate structures to meet payrolls and operating expenses plus interest on investment. None of that is profit, he said, even in terms of the thinking of the man on the street. When this fact is brought to the people, the politicians will have a difficult time in characterizing utilities as "vested interests."

Warns on Atomtic Plans

Congress should spend money for research and development but refrain from launching a crash program of building large reactors, said Sutherland Dows, president, Iowa Electric Light & Power Co. He is a member of the committee on the peaceful uses of atomic energy. The large reactors, he said, would have to be rebuilt soon, and such a program would be expensive without speeding up development.

Annual kwhr per customer reflects a company's interest in the gas business, according to Dell B. Raymond, Iowa Public Service Co. One Iowa company, whose annual kwhr per customer is lowest, has the most gas meters, he said, and another company with the highest electrical use has the fewest gas meters.

Relay Care Necessary (*Continued from page* 48)

with some margin for faults resulting in potential transformer secondary voltages of 80 v or less and provides a good pickup margin for the normal 110 v. Any higher setting should be viewed with caution.

A quite satisfactory application is shown in Fig 5a where the line impedance is 40% and the system impedance behind the bus, 20%. The voltage at the relays is

$$\frac{40}{20+40} \times 110 = 73 \text{ v},$$

which is well below the 90-v setting.

Fig 5b shows the same line and station except for added generation and lines feeding the station which have reduced the system impedance behind the bus to 4%. Voltage at the relays is then

$$\frac{40}{4+40} \times 110 = 100 \text{ v},$$

which would keep the relays shorted during a fault. When this situation is reached, it is necessary to replace overcurrent with impedance relays which actually measure line impedance to the fault and consequently are not limited by voltage.

Sometimes it is necessary to apply voltage control to reverse power relays. This course must be reviewed with extra caution from a ground-fault protection standpoint. Because of the characteristics of these relays, one is used on each of the three phases. As the three phase relays can usually be set to cover ground faults, ground relays can be dispensed with.

Tax Pamphlet Is Two-Edged

It instructs employees how to fill out income tax form and tells how federal taxes can be reduced. Idea came from a vice president at Florida Power & Light

What better place to preach economy in government than on your income tax form. Well, that can't quite be done, but M. B. McDonald, vice president, Florida Power & Light Co, has come up with the next best thing. He has suggested that the tax-saving theme be carried in a pamphlet designed primarily to instruct taxpayers how to fill out their income tax forms.

Prentice-Hall, Inc, the publishers, already had the instructions pamphlet on the presses last year, but they snapped up McDonald's idea and added pages to their pamphlet. The result is a pamphlet, suitable for company reading racks, that outlines two ways to reduce your taxes: (1) Take advantage of all deductions on returns, (2) Urge government economy.

McDonald reported "excellent pick-up rating" for the pamphlet on the company's book rack service. His company also sent the pamphlet to several thousand small employers in the Miami area. The response was enthusiastic. He's looking forward to an even better showing this year when the pamphlet will be better integrated.

The new pamphlet draws heavily on the Hoover Commission Report to document its government economy story. It stresses the "unjustifiable competition of Government with private enterprise." And it cites a number of examples from the Hoover Report of waste and inefficiency in federal government operations.

The 1957 version of the pamphlet, expected to be available from Prentice-Hall in about two weeks, will point out cost of federal power projects to the taxpayer.

Eleven electric utilities have already indicated they will use the pamphlet for employee benefit.

All-Weather, Hard Hats Gain Approval

Light-weight, hard hats are making a hit with Indianapolis Power and Light Co line crews. Before they were adopted for use a serious accident occurred which might have been prevented. Since they have come into common use by the company line crews at least three potentially serious accidents have been thwarted by the protective headgear.

All-weather features of the hats are displayed above. Charles Roberts, left, shows how winter wear hood goes inside hat. Carl Davis, center, models hat showing how winter hood protects back of neck. Tom Finch, right, holds summer model of the hard hat.

NEWS FROM EJC

Engineers Joint Council, made up of some 14 national and state engineering societies and associations, recently began publication of a news letter to be sent to constituent members. The following notes are based on the news letter:

Engineers protest National Labor Relations Board action recognizing a group of professional engineers and non-professionals as a voting unit in collective bargaining determinations. Both Engineers Joint Council and National Society of Professional Engineers have filed briefs before the U. S. District Court in Washington seeking to block the action. Conceivably, EJC feels, in a close vote a minority of technicians could control decisions by a predominantly professional engineering group. Accordingly the Council has engaged counsel to maintain its position.

What's score on engineers' incomes? Questionnaires now being returned by some 10,000 companies, government agencies, and engineering educators should tell the story. Final results are being tabulated and will be made public about the middle of January.

Take an interest in your local schools, warns EJC. Despite national efforts to make communities aware of the importance of school science programs, many school boards are building gyms and swimming pools instead of faculties and labs. Help get first things done first by being active in your community school board or parent-teachers association.

Report on Professional Standards and Employment Conditions, now in its third printing, is much in demand by industry. Available in bulk at nominal cost, it is free on request to individuals from Paul Lange, EJC, 29 West 39th St, New York, 17, N. Y.

Four new groups join EJC. American Society of Agricultural Engineers, the Los Angeles Council of Engineering Societies, the Kentucky Society of Professional Engineers and the American Society of Heating and Air Conditioning Engineers have joined the EJC.

Precision-shaping POLE STAR cores keeps exciting current and core loss uniformly low

Pole Star distribution transformer cores are precisely shaped by "squeezing" the laminations between the outer, riveted lamination and a hydraulically inserted annealing block. Retention of this shape is assured by controlled-atmosphere annealing, after an outer annealing form has been placed around the core as shown.

After a Pole Star core is given its preliminary shape by forming dies, the outer lamination is riveted into position and an annealing block is inserted into the window of the core by means of the hydraulic press pictured above. By thus "squeezing" the laminations between the annealing block and the outer lamination, the core is precisely shaped in accordance with predetermined specifications for the particular size. The laminations, which had been cut to progressive lengths for telescoping of the individual pieces, are uniformly lapped.

Both the finished core shape and the uniform laps are figuratively "locked" in place by the stress annealing operation that follows. Annealing in controlled-atmosphere furnaces also insures retention of the inherent qualities of the grain-oriented steel. Any adhesions that may be formed during annealing are eliminated later, because laminations are separated from each other as they are placed in the coil and individually re-lapped.

Such rigidly controlled production means that the advantages of Pole Star's patented lap-on-top core are as consistent as they are outstanding. The individually lapped laminations create a large cross-section area at the lap that reduces the density and prevents a concentration of flux. The absence of gaps or butt joints assures a low exciting current. High interlamination resistance, plus the absence of adhesions, keeps core loss at a low value.

167 Production Controls make Pole Star Best!

POLE STAR

pt

3 through 500 kva, through 67,000 volts

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** Greater Pittsburgh District

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES

Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Steel Driving Stud for Sectional Ground Rods

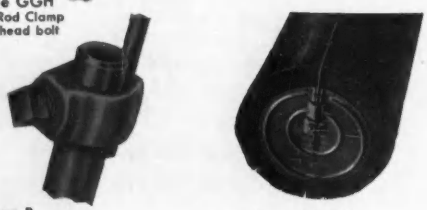
Type GG
Ground Rod Clamp
Socket set screw

Copper Alloy Coupling for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GGH
Ground Rod Clamp
Square head bolt



Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

Available Through Electrical Wholesalers Everywhere

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An Example of Indiana Load-Building, this . . .

Truck Stop Has a 175-kw Load

- Nine-kw heat pump provides air conditioning
- All-electric kitchen has full range of equipment
- Serves 100 trucks and furnishes 500 meals daily

Story's Truck Stop, nine miles west of Muncie, Ind., is one of the most complete all-electric operations of its kind in the Midwest. Served by Indiana & Michigan Electric Co, it is a prime example of the load building opportunities which lie in wait along the nation's big highways—opportunities which will expand still more as President Eisenhower's $33 billion road construction program gets underway.

The Storys traveled from Harrisburg, Pa., to St Louis, Mo., studying the truck stops along the way before they started construction of their own place. The experience they gained in large part dictated their choice of all-electric equipment. Connected load totals a whopping 175 kw. This doesn't include an adjacent 20-unit motel.

A nine-kw heat pump heats and cools the restaurant and truck stop. Food is stored in a 6 ft by 8 ft walk-in type refrigerator with facilities for both storing and freezing meats and vegetables.

The all-electric kitchen is equipped with a range, baker's stove, a 25-lb fryer, a 30-in. grill and a hot food table. An electric meat slicer and broiler adjoin the refrigerated cabinet.

In a separate room off the main kitchen is the baking department, which also houses the heat pump and water heater. A two-deck all-purpose oven bakes the truck stop's 30 pies daily as well as biscuits and rolls.

The dining room is lighted by three continuous rows of shielded fluorescent units. On the dining room wall adjacent to the kitchen are facilities for food service. They include a 35-cu ft reach-in refrigerator, beverage cooler, roll warmer, coffee maker, a refrigerated display salad case, ice cream cabinets, milk dispenser and ice machine.

The sanitation department has the latest type dishwasher with a 180 F booster heater for rinsing.

Several contracts have been signed with trucking companies who are now buying 70,000 gal of gasoline and 3,000 gal of oil a month. The truck stop-motel-restaurant is a 24-hr-a-day operation, serves 100 trucks and their drivers daily. The restaurant itself seats 96 people and can handle about 500 customers each day.

"Our heat pump insures customers of an ideal room temperature the year around," say the owners, "and has been a contributing factor in making our place a regular stopping point for long-distance truckers, travelers, and the local trade."

S&S SHORTS

Trouble with Home Lighting?

Haphazard accumulation of lighting units is a cause of home inefficiency and eye-strain. This is finding of Cornell University's Housing Research Center in first-year report of two-year study backed by Lightolier, Inc. Most home owners desire high degree of flexibility in home, *i.e.* space to rearrange furniture, but lighting in most cases limits it.

CP&L Bags $150,000 EAR

Carolina Power & Light Co added 8,527 kw and well over $150,000 new estimated annual revenue in "Go Electric" commercial cooking and water heating campaign. Eight commercial salesmen and 20 combination residential-commercial salesmen sold 2,549 kw in water heating and 5,978 kw in cooking equipment during 3½-month drive.

Employees Move 6,403 Freezers

Using employee-salesmen armed with prospect cards, Arkansas Power & Light Co sold 6,403 food freezers in a three-month campaign. Sales went 160% over quota.

Built-in Vacuum Cleaner

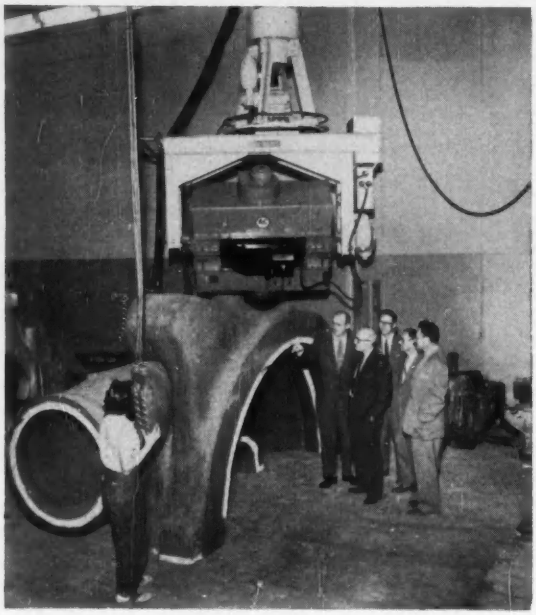
Now a built-in vacuum cleaning system for homes. The unit has a 1-hp motor which is started when a cleaning hose is plugged into a room outlet. Manufacturer is the newly-organized Centralvac Corp, Chattanooga 5, Tenn.

Commercial Kitchen Lighting

An 8-page report titled "Lighting for Commercial Kitchens" has been published by Illuminating Engineering Society. It includes recommended lighting levels, brightness ratios and fixtures selection. For copies write IES 1860 Broadway, New York 23, N. Y. Price is 15¢ each.

Dealer-Market Food Plan

A food freezer plan which gives the freezer buyer a five-year protection against food spoilage plus $100 to $150 worth of food from any foodstore of his choice has been inaugurated by Hotpoint Co. Plan is designed to help local appliance dealers and supermarkets work together on their promotions.



A-C Readies Betatron Test for Commonwealth Ed Turbines

The steel casting shown is the inlet reaction element for one of the two 1,800-rpm, low pressure turbines for a 300,000-kw unit in Commonwealth Edison Co's Fisk station, Chicago.

It is being readied for radiographic inspection by the universal positioning 22,000,000-volt betatron in A-C's West Allis works.

Observing the demonstration in A-C's betatron laboratory are, 1 to r, E. S. Evans, mechanical design engineer, A-C steam turbine department; R. B. Gutekunst, superintendent of generating stations, and C. G. Gorder, assistant to the superintendent, both of Commonwealth Edison; F. M. Scott, A-C's Chicago district; and M. H. Goedjen, supervising engineer for Commonwealth Edison.

G&W Moves to New Plant in Chicago Suburb

New home of G&W Electric Specialty Co is at 3500 West 127th St., Blue Island, Ill. This new plant has 120,000-sq ft floor area and is located on a 20-acre site in a southwest suburb of Chicago. Telephone is FUlton-8-5010 through the Blue Island Exchange.

Increased production facilities and improved customer service are provided, stated C. W. Sward, vice president. The company was founded in 1905 and specializes in the design and manufacture of cable accessories such as terminating, interconnecting and sectionalizing devices, potheads, boxes, oil fuses, load break oil switches and splicing kits.

Electric Service Works to Sell French De-ionizer

The Cougnard de-ionizer, a French designed lighting protective device, is to be distributed in the U. S. by Electric Service Works, Delta-Star Electric Division, H. K. Porter Company, Inc., Philadelphia. The distributorship was appointed by American Lightning Protection, Inc, Rouses Point, N. Y.

This de-ionizer has been used reportedly for several years in Europe and Canada to protect transmission and distribution circuits against high frequency atmospheric disturbances. U. S. has experimental installations.

This protective device is described as a build-up of metal assemblies with two cup-shaped parts and several disks. One section is connected to a conductor and other section to ground. Installations are at the deadend of conductors where a line makes turns of 30 to 90 deg.

L-M New California Plant to Serve Western States

Construction was started on a $1.25 million plant in Visalia, Calif., for Line Material Co, advises R. G. Wheaton, president. Completion is scheduled for May 1, 1957. First production items will be the company's Round-Wound transformers.

Initially a 65,000-sq ft building is being erected. The company acquired the 20-acre Visalia site last August. Wayne Shelley will be factory superintendent.

Westinghouse to Exhibit A-Plant Models at Show

Two commercial atomic power plants now under development will be exhibited in animated model form by Westinghouse Electric Corp at the National Exposition of Power and Mechanical Engineering, November 26-30, at the New York City Coliseum, according to the company.

One is a model of the first homogeneous type reactor for commercial power use being co-developed by Westinghouse and Pennsylvania Power & Light Co of Allentown, Pa. The other is of a pressurized water reactor being developed for Yankee Atomic Electric Co of Boston, Mass.

Both models will demonstrate the over-all workings of the reactors, such as heat generation within the reactor core, the transfer of this heat to heat exchangers, generation of steam and its subsequent conversion to electric power. Also various components of nuclear power plants will be shown, including control rod mechanisms, hermetically sealed pumps and valves, liquid-sodium pumps, and Corox heaters. Westinghouse will occupy booth number 732 at the show.

(*More M & M on page 59*)

FUSE LINKS

Button cap, special washer on General Electric Fuse Links

Speed Re-fusing

without special tools—permit replacement in less than a minute

For quick removal of a blown fuse, General Electric fuse links feature a button cap and special washer. The washer's flat undersurface completely seals the upper end of the fuse-holder tube—eliminating the possibility of the cap becoming soldered to the tube by molten fuse metal. The cap can always be removed quickly and easily. No special tools are needed. Re-fusing can be completed in less than a minute.

Fusible element with a low melting point, used in every G-E fuse link, helps protect service continuity and permits better system coordination.

Line Sectionalizing, pioneered by General Electric over 20 years ago, is even more vital today. That is why so much more engineering goes into a fuse link at General Electric than many other products of comparable size.

General Electric fuse links are available in ratings for every system need, including EEI–NEMA Standard "K" and "T," Universal "N" rated and High Surge

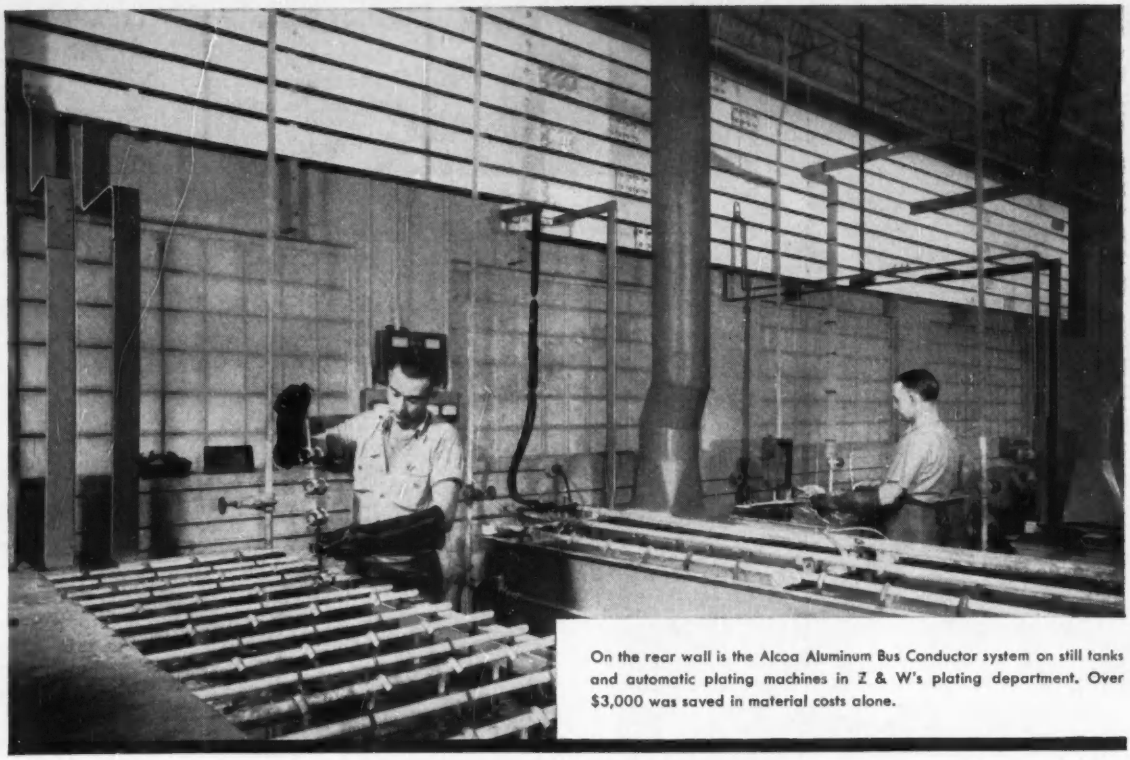
For further information, contact your nearest G-E Apparatus Sales Office, or write for bulletins:
EEI–NEMA links.....GEA-6264
Universal "N" links.....GEA-1994
Hi-Surge links.....GEC-862
General Electric Co., Schenectady 5, New York.

433-17

LIVE BETTER ELECTRICALLY

Progress Is Our Most Important Product

GENERAL ELECTRIC



On the rear wall is the Alcoa Aluminum Bus Conductor system on still tanks and automatic plating machines in Z & W's plating department. Over $3,000 was saved in material costs alone.

$3,000 IN DIRECT SAVINGS

With Alcoa Aluminum Bus Conductor at Z & W Manufacturing

When Z & W Manufacturing Corporation designed their new 130,000 sq ft plant in Wickliffe, Ohio, they wanted equipment second to none—yet costs were closely watched. One of the best of the money-saving acts took place in their plating department.

After a detailed study, they used Alcoa® Aluminum Bus Conductor to carry the 12,000-amp load from individual rectifiers to the six plating lines. Compared to a copper system Z & W got the same conductivity from half as many pounds of metal. Only difference was a slight increase in size. In installing a system using high-conductivity aluminum alloy, Z & W estimates they saved more than $3,000 in direct material costs alone.

Easy fabrication and installation

Other important benefits and savings resulted from aluminum's light weight and easy handling. Also important was the ease of fabrication during their bending and drilling operations. The ½″ x 6″ bars were just bolted to 2 x 8's attached to the wall. Simple insulating washers and wood spacers were used.

Having some small copper bar stock on hand, they used that as leads in some places—other leads were aluminum. Trouble-free joints between copper and aluminum were made, as were all joints, with Alcoa Electrical Joint Compound and aluminum bolts.

Saves 50% on bus conductor

The same technical advice and assistance from Alcoa that enabled Z & W to engineer, design, fabricate and install this bus system are yours for the asking. Study how much you could save with Alcoa Bus Conductor—for expansion or modernization. Cost is about half. Just check the Yellow Pages of your phone book under "Aluminum" for Alcoa's nearest office. Or write, Aluminum Company of America, 2306-L Alcoa Building, Pittsburgh 19, Pa.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Your Guide to the Best in Aluminum Value

Mellon Institute Plans Radiation Research Lab

Mellon Institute, Pittsburgh, announced plans for construction of a million-dollar laboratory to house its recently established Department of Radiation Research. It will feature the Institute's first major source of radiation, a 3-million-volt Van de Graaff accelerator, now on order from High Voltage Engineering Corp in Cambridge, Mass.

General Matthew B. Ridgway, chairman of the Institute's board of trustees, said, "Mellon Institute is entering this field of research in the expectation that large segments of American industry will utilize radiation science in the future."

Anaconda Expands Plans for Chilean Production

Andes Copper Mining Co, Anaconda's Chilean subsidiary, recently outlined a new, expanded plan for mining and beneficiating copper ores of its El Salvador Mine Project. The ore bodies to be mined are near Indio Muerto Mountain, 18 miles north of the company's mines at Potrerillos.

The company formally presented its plans to the Chilean government. Under that country's new copper law, the plan, if approved, will result in a total investment of $80,150,000, an increase of $27,200,000 over that which was originally planned.

Andes Copper upgraded its plans at El Salvador because exploration drilling has revealed that deposits are much greater than was originally anticipated. The original estimate of 78,000,000 tons of ore averaging 1.6% copper have been changed to 200,000,000 tons of about the same metal content.

Under the new plan, the company's cost of producing copper will be reduced from present costs, and will be even lower than those estimated in March of this year when the El Salvador project got underway. Of the $80,150,000 planned for investment, $33,855,000 will be spent in Chile, and $46,295,000 will go for machinery and supplies elsewhere.

Normandy Wire Acquires Warehouse with Helioport

Normandy Electric Wire Corp, Bond and 2nd Streets, Brooklyn, N. Y., recently celebrated simultaneously the acquisition of a 65,000-sq ft warehouse and the inauguration of an industrial helicopter service for rapid delivery of wire and cable to its customers within a 400-mile range of New York.

The 10-year old firm specializes in distribution of source-inspected shipboard wire and cable that meets Navy and AIEE specifications. However, plans are underway to handle utility wire and cable with ratings to 15 kv, according to Abraham Goody, secretary of the company. The firm also has plans to handle multiple conductor control cables for the oil industry and the railroads.

Normandy is presently a distributor for selected products of General Cable Co, Okonite Co, and National Electric Products Corp.

PLANT EXPANSIONS

• Olin Revere Metals Corp, owned 50-50 by Olin Mathieson Chemicals Corp and Revere Copper & Brass, Inc, reportedly has exercised its option on a 4,100-acre tract of land at Burnside, La., as a site for a proposed $50 million alumina plant. This is part of a $231 million deal by O-M and Revere.

• A 40% increase in its manufacturing facilities is reportedly the result of an expansion by Acra Electric Corp at its Franklin Park, Ill., factory. This is Acra's fourth expansion in 18 years. The firm makes baseboard electrical heating elements. An engineering lab is also planned.

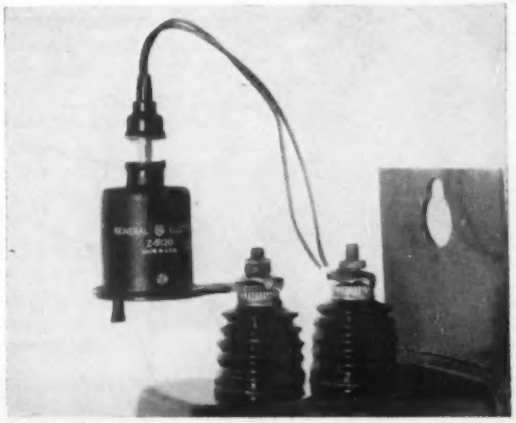
• Plans for an IBM Research Center on 224 acres of land at Yorktown, N. Y., were announced recently by International Business Machines Corp president, Thomas J. Watson, Jr. Facilities will house laboratories and administrative offices for a research staff which is expected to number 1,600 persons.

• Weston Electrical Corp and Daystrom Pacific Corp, both subsidiaries of Daystrom, Inc, are expanding their operations in Southern California. Weston has completed a 5,000-sq ft plant at 2001 S. Grand Ave in Los Angeles which will reportedly provide the company with facilities for instrument sales and field service. Daystrom Pacific recently broke ground at Lincoln Blvd and Manchester Ave in the same city, for a 50,000-sq ft gyroscope and control instruments manufacturing plant.

GE Has Protective Gap For Series Capacitors

General Electric Co has announced the development of a protective gap for series capacitors used with transformers. Field tests are nearing completion, and it is reported, the company expects to have the gap available sometime this fall.

The device is designed to prevent extreme voltages from appearing across a series capacitor when abnormal current conditions occur, and to reinsert the capacitor into the circuit upon return to normal current conditions. It is connected in shunt across the terminals of the capacitor.



BUSINESS OUTLOOK

Electrical World
NOVEMBER 19, 1956

The major political developments of the past few weeks—the election and the foreign situation—can have important economic consequences.

As for the election, business is so strong this year that, regardless who won, it was apparently set to move along unruffled. Most basic industries have large backlogs of orders to carry them well into next year. Thus, even if the election results had been disturbing enough to cause some cancellations, business would not have felt any drag for several months. Furthermore, consumer buying power is pushing retail sales to record levels. The way the economy is rigged today stock traders are about the only group that can chart immediate reactions to elections. Evidently, the market had fully anticipated an Eisenhower victory, and any satisfaction over its magnitude was swamped by upsetting news from the Middle East.

• • •

Voters gave support to about 90% of the $2.7 billion of bond issues proposed by state and local Governments. Roughly ⅔ of these are earmarked for highways, schools and other construction projects. These local building projects added to business investment should aid the boom in capital expenditures.

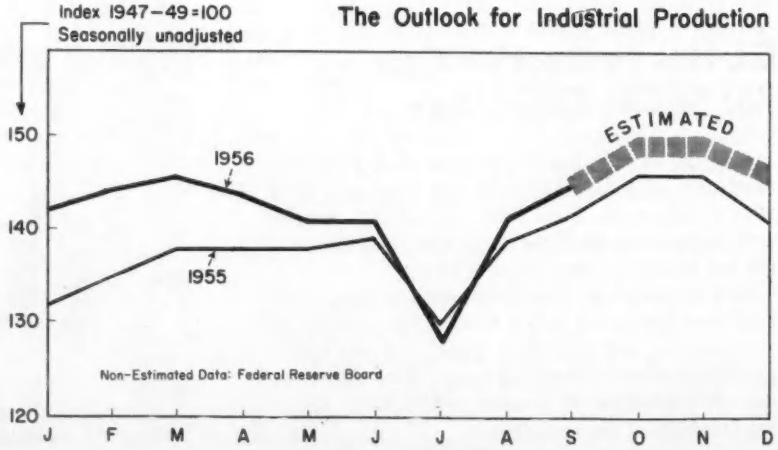
International political events, on the other hand, may have a considerably sharper impact on business. Reports reaching Washington indicate that a shift in leadership may have occurred inside Russia. If true, it undoubtedly marks the end of the tourist trade era and a return to a state of cold war.

• • •

It's almost certain Government will play a more active role in the economy next year. Both foreign aid and defense budgets are very likely to get boosts. On the home front the Government may speed up procurement schedules. As the need for some defense-related items—tankers for instance—is critical, ODM may have to reevaluate defense goals and revive fast write-offs to speed up production. Also the President may invoke his emergency powers to allocate materials.

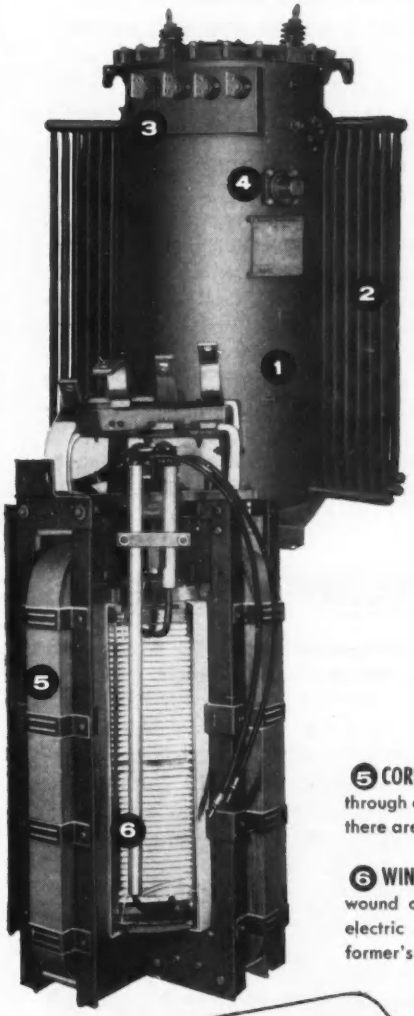
On the foreign front the Government will incur heavy expenses if it has to ship oil to fuel-starved Europe in an effort to forestall an economic crisis there. Federal funds immediately available for foreign aid are limited. Thus, immediate aid will be small unless Congress is called into special session.

The Outlook for Industrial Production



Wagner Form W Substation Transformers

...in ratings through 500 kva, voltages to 67,000



Wagner Form W Transformers are available for every requirement of modern distribution systems—from 3 to 500 kva, with high voltages from 480 to 67,000 volts. In all ratings you get the excellent performance and complete dependability for which Wagner Transformers have been noted for 65 years . . . plus the compact design and light weight that makes Wagner Form W Transformers easy to handle and install.

Check these important features of 250 to 500 kva ratings:

1 HOUSED IN ROUND TANKS . . .
inherently strong . . . compact . . . light in weight.

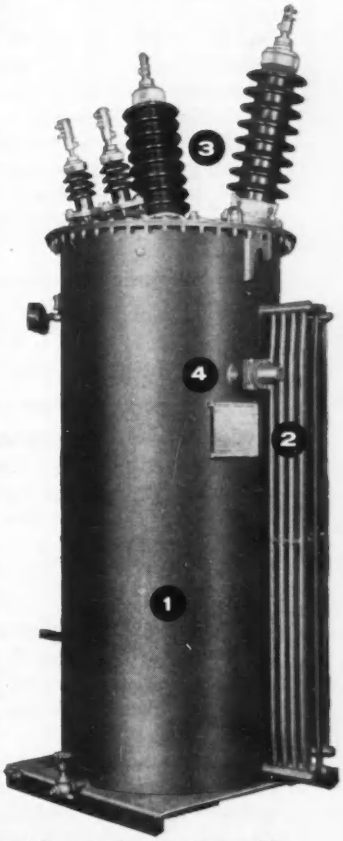
2 ELLIPTICAL TUBE RADIATORS
for efficient cooling . . . provide maximum radiating surface in minimum space.

3 BUSHINGS
ASA standard high voltage bushings on transformers 23 KV and above (right). Locked tank wall bushings on transformers with low voltage ratings, 600 volts and below, (left).

4 WEATHER-PROOF, TAMPER-PROOF TAP CHANGERS . . . operating handle is protected by cover which shows tap position . . . can be padlocked.

5 CORES are of cold-rolled, oriented grain steel, wound through and around the coils. In ratings from 250 to 500 kva, there are 4 core sections spaced 90° apart.

6 WINDINGS . . . high voltage and low voltage coils are wound on insulating cylinders of high mechanical and dielectric strength . . . the winding best suited to each transformer's rating, voltage and current is used.



Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

Wagner maintains a nationwide organization to provide fast, convenient service with branches in 32 principal cities.

T56-15

Wagner Electric Corporation
EST. 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

IN THE INDUSTRY

Hearing Tests for Job Applicants?

Electric utilities, as well as other industries, must handle an occasional loss-of-hearing problem. Those who have dealt with such cases know that they can be difficult even though they are relatively rare. The employee finds in one way or another that his hearing is defective. This may impair his working efficiency. Certainly in those states which have hearing loss compensation laws, the question arises as to whether the loss results from on-the-job conditions.

To help fix employer responsibility in such cases the most useful precaution is a pre-employment hearing test. This recommendation was made by Robert A. Ewens, executive director, Wisconsin Manufacturers Association, at the recent Noise Abatement Symposium in Chicago.

Better to Find Out Beforehand

"A pre-employment audiometer examination is at least a starting point," said Ewens. "A person may be 20% defective in hearing when he is hired and 10 years later, due to either noisy environment or some other cause, may be 25% defective. His employer will know at least that he is not responsible for the first 20%," Ewens explained.

Allis-Chalmers Manufacturing Co, according to Ewens, long has made pre-hiring tests and finds that one quarter of the job applicants have some hearing defect.

The Wisconsin Manufacturers Association for five years has advocated the use of audiometers in pre-employment physical examinations, but admits the campaign has not been successful.

"There are too many people in industry who think this problem does not affect them," Ewens asserted. "Yet some doctors point out that someone who has very sensitive hair cells may find difficulty in hearing even with 80 or 90 decibles—or approximately four typewriters pounding at one time."

Test Results Serves Other Purposes

Aside from the loss compensation angle, audiometer tests might also be useful in employee placement. As is the case with other handicaps, defective hearing may prove an asset in some jobs—a definite liability in others. Jobs that require prolonged concentration with relatively little contact with other people, for instance, may be much more suitable for those a bit hard of hearing than for those very sensitive to sound. Other jobs may be entirely unsuitable.

With the rising interest in noise abatement, audio tests for applicants and employees may eventually be useful in another way. They could provide some indication as to whether certain plant or job conditions do lead to hearing impairment. Some groups are already studying the possibility of further alleviating industrial noise. Audio test data may very well furnish information that will lead to a more intelligent consideration of problems in this field.

TECHNICAL NOTES

A good reactor coolant should have good heat transfer characteristics, low neutron absorption, low melting point, low vapor pressure, good radiation and thermal stability, low corrosive characteristics, chemical inertness, unobjectionable induced radioactivity, and low cost.

Service continuity is enhanced by close cooperation between equipment manufacturers, industrial engineers, and utilities to select suitable protection methods, sequence, and coordination.

A special post-office box speeds mail handling to the purchasing department of New England Electric System. All order acknowledgments and invoices are now sent by vendors directly to this box rather than to the company address. By eliminating sorting and distributing with the general mail, use of the box minimizes confusion and frequently saves several hours in transmission time between vendors and the purchasing department. The box number is printed on company purchase orders.

High-pressure water-fog system combined with chlorobromomethane and CO_2 fire-fighting equipment is considered most effective for steam plants. This type of equipment is being installed in all Southern Co system plants.

Leakage current across line insulators drenched with salt spray can trip and lock out line circuit breakers.

Salt spray whipped from the ocean by 40-mph wind may reach 4,000-ft altitude and fall on electrical facilities a half mile or more inland.

Known coal reserves in the U. S. are adequate to last 1,600 years if consumed at the average rate of the decade ended 1950.

Institutional Buyers Gain . . .

. . . individual investors drop as holders of utility securities, says Utility Investment Analyst Harold H. Young in letter to all state regulatory bodies

"Many individual investors are becoming apathetic about public utility common stock as vehicles of investment. On the other hand, institutional investors have been more important factors in the utility equity market." This statement was made in a letter to the chairman of the various state public utility commissions by Harold H. Young, chairman, Public Utilities Securities Committee, Investment Bankers Association of America.

These conclusions were reached, Young said, from a survey in which electric and gas companies were asked to furnish figures as to the changes in the composition of their stockholder list in recent years. An analysis showed that "they reveal a definite and general (although not universal) trend toward lower percentages of total common stock ownership in the hands of individuals and a higher percentage in the hands of institutions."

He found that investors are expressing the desire to buy common stocks which offer possibilities of capital gain and evidencing less interest in current income. He cited two reasons for this trend:

- Investors are influenced because federal income tax structure permits them to retain a bigger percentage of capital gains than of dividend income.
- Purchasing power of the dollar has been deteriorating and the trend is continuing.

Accordingly, he continued, "many investors insist on stocks which promise an increase in value at least sufficient to offset the attrition of inflation."

A "straight income-producing investment" has less appeal than it had a few years ago. Many investors, he pointed out, feel public utility stocks fail to offer protection against inflationary trends. This causes them to "shy away from them."

Of course, Young said, the question can be raised, "Why worry about loss of private investor interest so long as the slack is being taken up by institutions." Unfortunately, he said, the programs of institutional investors are not consistent or continuing. Rather, he continued, they are subject to change with variations in many unrelated factors, and a course being generally pursued today may be altered or abandoned tomorrow.

He concluded his letter to the commissioners by saying:

"We feel that if the utility companies are going to raise successfully the hundreds of millions of dollars in common stock money which construction programs will require in the years ahead, sympathetic consideration on the part of regulatory authorities will be required . . . We are eager that commissions see the picture, as we see it, of greater investor insistence on prospective increases in earnings and dividends. We believe that regulatory authorities are sensitive to the need of granting rates high enough to attract new capital successfully."

Mooch Doesn't Mooch; She's Paid

Mooch, the salaried canine, accepts a check for her week's work from Boss George Noland, erection supervisor for Combustion Engineering Co, Inc, at the construction site of Southwestern Public Service Co's 70,000-kw Cunningham Plant near Hobbs, N. Mex.

She began her tenure as a power plant constructor in 1950 when SPS began construction of its 250,000-kw Plant X near Earth, Tex. She found her way to the construction site after being thrown out in a nearby highway to make her own way in the sand hills of West Texas.

Initially the brown spotted pup, with a strong collie strain, was a buddy to everyone with a lunch pail. Recently, however, she has given the ponderous amount of her affection to one—George Noland. This was a wise move, for it was the boiler erector supervisor who put her on the payroll at a $1 a week.

Delaware P&L Contests Franchise Tax Levy

Delaware Power & Light Co has asked the courts to determine the validity of a franchise tax levied on utility sales by the City of Newark, Del.

The special tax of one-half mill per kwhr was adopted by the Newark city council Oct. 16 as a revenue measure.

In initiating the court action, Delaware Power Pres H. H. Plank said, ". . . we feel it is our duty to protect our customers in Newark from special taxes where there is a question as to the legality of such taxes." He noted too that such tax would have to be collected only from company customers within the city limits of Newark.

Pending final action by the court, Delaware P&L will collect the franchise taxes and put them in escrow.

(*More Financial on page* 64)

Future Financing

Slow Year End

Utility financing will be light through the remainder of the year. Only $150,000,000 issues are on the calendar.

Closed for Holidays

No issues are scheduled for sale after December 15 because certain institutional investors close their books on that date.

Convertibles Are Popular

Convertible debenture offerings are rather popular with industrial concerns this year. On November 15, Sinclair Oil sold $170,600,000 of this type of security. In December two such issues totalling $58,400,000 will be sold.

Memphis Bonds Coming

City of Memphis intends to sell the $154 million bonds for its power plant before the end of the year.

More Election Returns

Voters approved the sale of $2.3 billion municipal issues. This is reported to be the largest amount of municipal financing approved on one election day. However, most of these issues will individually be less than $25 million, the minimum on our sheets, and therefore will not be included on our calendar.

Due Diligence Meetings

Nov. 29, Long Island Lighting Co; Nov. 29, Dallas Power & Light Co; Dec. 6, Florida Power & Light Co; Dec. 6, Delaware Power & Light Co; and Jan. 11, Louisiana Power & Light Co.

(Furnished by the Irving Trust Company from the Financing Calendar)

Date	COMPANY	Amount of Offering (Millions) DEBT	EQUITY
NOV. 20	Texas Power & Light	10.0-C	.....
20	Greenwich Killingly Expressway	75.0-C	.....
21	Arizona Public Service	.....	10.0-N-cv Pfd
NOV. No Date	U. S. Governments	3,300.0	.....
DEC. 1	Burroughs Corporation	30.1-N-cv-rt	.....
3	U. S. Governments	9,100.0- -R	.....
3	Dallas Power & Light	10.0-C	.....
4	Michigan Bell Telephone	30.0-C	.....
4	Public Service Electric & Gas	.....	33.0-N COM
4	National Cash Register	28.3-N-cv-rt	.....
5	Long Island Lighting	20.0-C	.....
11	Florida Power & Light	15.0-C	.....
11	Delaware Power & Light	.....	8.0-C Pfd
DEC. No Date	Massachusetts Port Authority	115.0-C-R	.....
	Texas Eastern Transmission	40.0-N	.....
	Memphis Power Plant	154.0-N	.....
4th Quarter of 1956 (Month not indicated)			
	U. S. Governments	1/2,000.0*	.....
	Central Vermont Public Service	1.0-N	.....
	Texas Gas Transmission	25.0	.....
	Kansas Nebraska Natural Gas	6.8-P	.....
	U. S. Rubber	50/60.0- -cv-rt	.....
	North Carolina State School	25.0	.....
	El Paso Natural Gas	30.0-P	.....
	J. P. Stevens	30.0-N	.....
	Southern Nevada Power	7.0-C	.....
	Ohio Thoroughfare Revenue	50.0-C	.....
	Sacramento Utility District	85.0	.....
	Grand River Dam Auth., Okla	27.0	.....
	Hetch Hetchy, California	54.0	.....
	Mississippi Valley Gas	1.5/2.0-P	.....
	Florida State Turnpike Auth	185.0-N	.....
	California Toll Bridge Bay	180.0	.....
	New York State Grade Crossing	25/40.0	.....
	Missouri State	75.0	.....
1957 JAN. 8	New England Telephone & Telegraph	35.0-C	.....
15	Louisiana Power & Light	20.0-C	.....
JAN. No Date	New England Power	19.0-C	.....
	Niagara Mohawk Power	50.0- -cv-rt	.....
FEB. 5	Public Service of Indiana	30.0-C	.....
	U. S. Governments	7,200.0-R	.....
FEB. No Date	Elizabeth River Tunnel, Va	43.0-C	.....
MAR. 15	U. S. Governments	3/9,200.0-R	.....
MAR. No Date	General Public Utilities	.....	23.0- -rt COM
	West Penn Electric	.....	10/11.0-C-rt COM
	Appalachian Electric Power	24.0-C	.....
	Southwestern Public Service	.....	7.3-N-rt
	New Orleans Public Service	6.0-C	.....
1st Quarter 1957 (Month not indicated)			
	Northern Natural Gas	24.0-N	.....
	Indianapolis Power & Light	.....	6.0-N Pfd
	Washington Gas Light	.....	5.0-N Pfd
	Pioneer Natural Gas	15.0-P	.....
	Kentucky Utilities	.....	4/6.0- -rt
	Southern Counties Gas	15.0-C	.....
	Kansas City Power & Light	20.0-C	.....
	Metropolitan Edison	22.0-C	.....
	Rochester Gas & Electric	12.0-C	.....
	Otter Tail Power	5.0-N	.....
	Philadelphia Electric	30.0-C	.....

Symbols: C—Competitive; N—Negotiated; P—Private; R—Refunding; cv—Convertible; rt—Rights; Pfd—Preferred; COM-Common. *Estimated.

Miami Seaquarium plans ahead electrically

Farsighted engineers for the new $2,300,000 Seaquarium in Miami specified 5kv Keystone-insulated feeder cables although initial voltage was only 220 volts. More than 2 miles of Keystone cable, buried directly in the sand, supply power to pumps, filter plant, underwater floodlights, P.A. systems, refrigerated fish-food vaults, and other modern conveniences that make conditions more pleasant for both man and fish. These 5kv feeders provide an excellent way of handling future increased load requirements by merely raising the distribution voltage.

These same engineers chose Keystone-insulated Armortite cable because it met their high standards for moisture resistance, high dielectric strength, continuous operation at high copper temperatures, and a tough outer sheath for direct burial that would be impervious to attack from corrosive salt-water seepage.

This is just one example of how Keystone-insulated cables provide dependable and economic power distribution. For more information on specific cables or for engineering assistance in selecting the right cable for your job . . . contact your nearest Okonite representative or The Okonite Company, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

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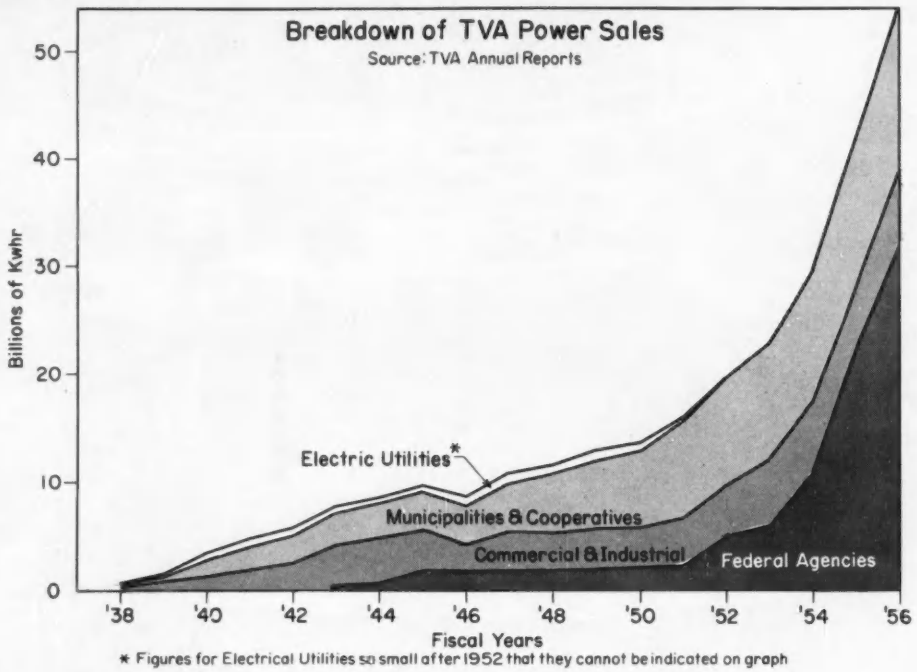
STATISTICS



* Figures for Electrical Utilities so small after 1952 that they cannot be indicated on graph

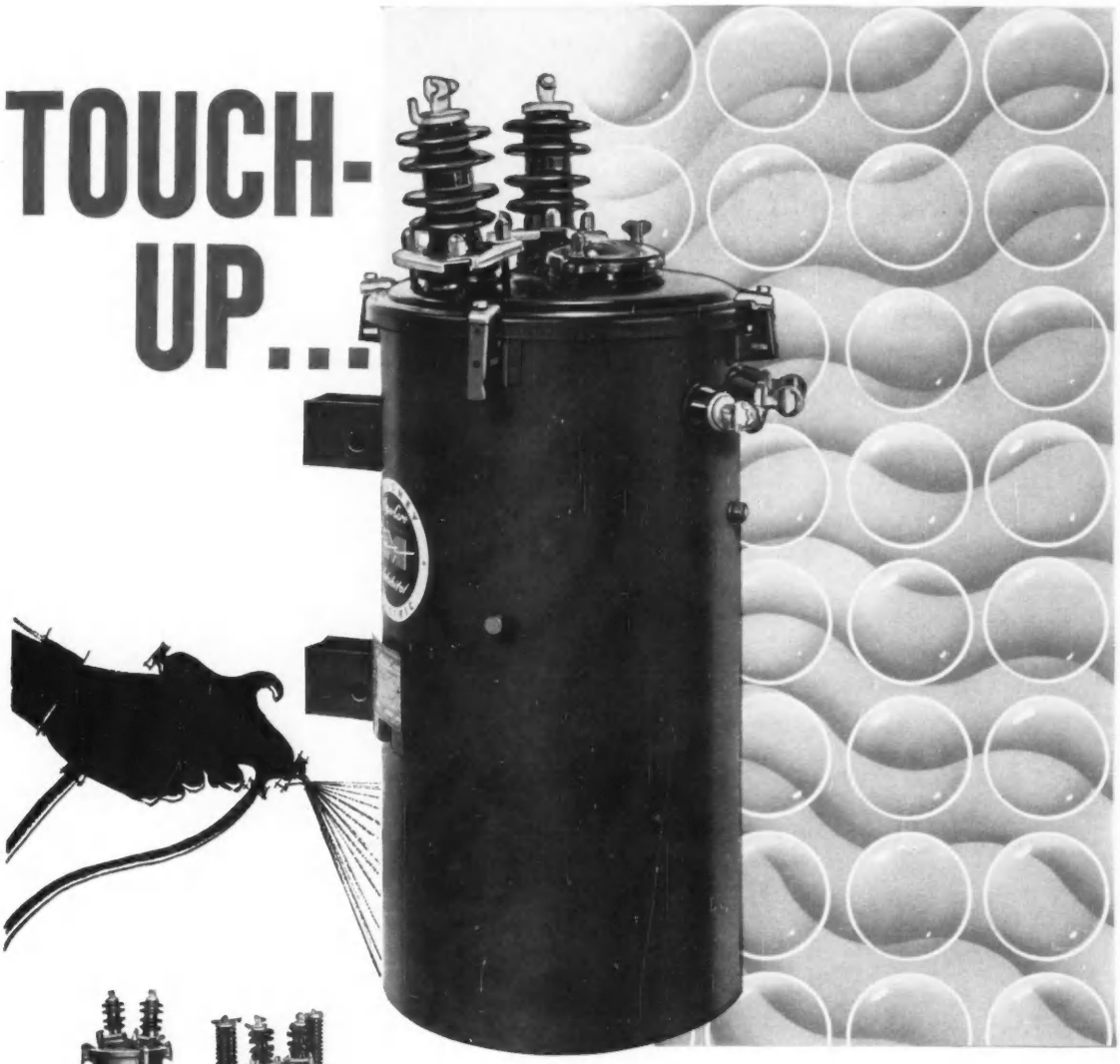
Power Statistics . . .

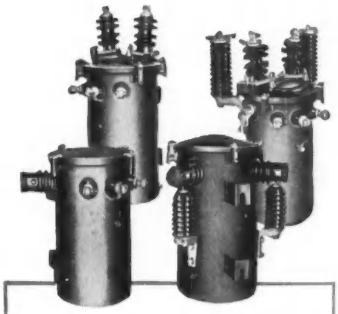
		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Aug.	118.01	117.54	110.03	7.3
Peak—Class 1 Systems. million kw	Aug.	98.0	94.8	91.7	6.9
Estimated Dec. '56 Peak	Aug.	106.10	106.09	103.83	2.2
Production—billion kwhr	Aug.	52.19	49.45	49.39	5.7
Hydro		9.54	9.91	9.54	0.0
Fuel		42.66	39.54	39.82	7.1
Sales—billion kwhr	Aug.	46.11	44.57	43.37	6.3
Residential		11.60	11.38	10.52	10.3
Commercial		7.95	7.74	7.40	7.4
Industrial		23.78	22.71	22.76	4.5
Other		2.78	2.73	2.68	3.7
Fuel Consumption	Aug.				
Coal—million tons		13.18	12.00	12.59	4.7
Oil—million barrels		5.18	4.32	5.37	−3.5
Gas—billion cu ft		142.04	136.97	132.70	7.0
Net Income Class A & B Co's—$ million	Aug.	97.17	96.86	93.14	4.3
Residential Customers—millions	12 mos.	45.25	45.10	43.95	3.0
Revenue per kwhr	ended	2.61¢	2.61¢	2.66¢	−1 9
Avg kwhr per customer	Aug. 31	2,914	2,899	2,682	8.7
Avg annual bill		$76.06	$75.66	$71.34	6.6

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Sept.	145	142	142	2.1
ENR Construction Cost	Nov.	147.6	147.6	141.1	4.6
BLS Cost-of-living	Sept.	117.1	116.8	114.9	1.9
New Orders for Machinery (1950 = 100)	Sept.	138	142	126	9.5
NEMA Sales					
Insulation materials	Aug.	153	117	147	4.1
Electric appliances		100	111	101	−1.0
Wholesale prices	Aug.				
Motors and generators		133.3	133.1	121.8	9.4
Transformers and regulators		139.7	134.5	127.3	9.7
Switchgear and fuses		153.8	152.6	139.2	10.5
GNP—annual rate—$ billion	2nd Qtr.	408.3	403.4	387.4	5.4

TOUCH-UP...





HyperCore Transformers are available from stock in all Standard Ratings in both Conventional and CSP designs.

ME56-19

Even Touch-Up Paint Is Sprayed On and Baked

Touch-up paint . . . when required . . . is sprayed on *every* HyperCore Transformer—*just like the original paint.*

It's baked, too, by infra-red heat—just like the original paint.

That's why dependable HyperCore Transformers have consistently uniform and durable surfaces that are highly impervious to weathering. Moloney HyperCore Transformers are *better than ever*—today—because they're products of Moloney's new and mechanized HyperCore Transformer Plant.

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Transformers and Inductors for Electronics

FACTORIES AT 5390 BIRCHER BLVD., ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Quality Control at Allis-Chalmers

Little Things are Important, too

Inspecting high and low voltage connections to see that they are secure . . . making sure the tap changer is set correctly . . . checking the oil level . . . seeing that all gaskets are oiltight . . . measuring the gap setting on the lightning arrester . . . inspecting general appearance of tank . . . checking the nameplate data against order information . . .

Little things — all of them — but they serve to point up the depth of Allis-Chalmers quality control — the painstaking care taken to assure complete customer satisfaction. Only after passing this detailed inspection is an Allis-Chalmers distribution transformer ready for crating and shipment.

A Bulletin Tells the Complete Story

Bulletin 61B8355 on Quality Control is available from your nearby Allis-Chalmers representative. You can also get it by writing Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS

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